IN THIS ISSUE—

GEORGE H. DUNGAN

ON

IMPROVING INDIA'S CROP PRODUCTION

RURAL EXTENSION TRAINING CENTRE

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EDITORIAL

The importance of evaluation in any extension programme can hardly be overestimated. For, through an impartial appraisal of the results obtained in relation to the principal objectives of the project evaluated, we can not only know how well we are doing a particular extension job but also obtain clear cut and scientific answers to many fundamental questions regarding the ways of organising extension work, the type of workers to be employed, the methods of recruitment to be followed in their selection, the ways of approach towards villagers to be adopted, and so on. The findings of carefully planned and conducted extension evaluation studies are thus certain to be of far-reaching value, particularly in India, which at present is almost halfway in the world's biggest rural development programme, the ultimate target of which is to cover all the five and a half lakh villages in the country.

A good deal of pioneering work has been done in this field by the Programme Evaluation Organisation of the Planning Commission, whose reports on the working of the Community Projects in the country have rightly attracted much attention. But from the very nature of its responsibilities, which are of an all-India nature, this Organisation has not been able to undertake many detailed studies of particular projects.

The members of the Evaluation Committee of the Allahabad Agricultural Institute, therefore, deserve to be congratulated for having undertaken and carried out a detailed study on the relationship between worker performance and: (1) the level of education of the extension worker; and, (2) the method of approach, in the Extension Pilot Project at Jamnapur Punarnirman.

This Pilot Project, which covered 428 "villages" in the Meja and Karchana Tehsils of the Allahabad District, had a population of 1,87,000 (1951 Census) and a staff of 55 **Gram Sevaks.** This area was divided geographically into four circles or the working areas. In each circle a different method of approach, viz., occupation (agriculture), literacy, home and family, and felt needs was used by extension workers.

Testing the effectiveness of these four different methods of approach was the first aspect of the research in this project. The second aspect of the research was to compare the effectiveness of the resident village workers having different backgrounds of education and training. Persons with different qualifications in this sphere, viz., college graduates, intermediates, matriculates, constructive workers (those trained in the Gandhian School of thought in Gandhi Ashrams or similar institutions) and husband and wife teams (couples) were employed as **Gram Sevaks**. Approximately equal numbers of each of these types of workers were placed in each of the four circles.

The findings of this study, which have far-reaching implications, were as follows:—

1. Differences in the educational level and the type of training have a bearing on the performance of the village workers.
2. Among the single workers, the graduates turned in a higher level of performance than the other categories of workers.
3. Couple units were able to get relatively more practices changed per unit of time and to make a greater number of contacts than any of the other groups.
4. Within each category of workers there were substantial differences with regard to the level of performance among the individual workers.
5. Among all categories of workers, an over-all improvement in their efficiency with the passing of time was indicated.
6. Couple units and graduates got off to a better start and maintained the lead, throughout the period of the experiment, except for intermediates who, although slow to start, surpassed the graduates in their performance in the fourth season.
7. Intermediates showed the greatest capacity for progress in all respects and with the passage of time they surpassed all categories of workers except the couple units in the rate of contacts.
8. The largest number of practice changes was effected where the felt needs approach was followed.
9. Of the four approaches (emphasis) tested, placing primary emphasis on agriculture resulted in the smallest number of practice changes.
10. Emphasis on felt needs got the extension programme off to a good start in the first season and maintained a superior rate of

practice changes throughout the experiment, while emphasis on agriculture resulted in the least significant improvement after a comparatively slow start.

11. The initial emphasis on agriculture did not result in a larger percentage of agricultural changes than those in the home-and-family and felt-needs circles. (This was probably because most of the felt-needs pertained to agriculture and there was enough freedom to build on felt-needs in the home-and-faimly circles with the result that agricultural changes in the agricultural circle were about as numerous as in the other circles).

12. Achievement in literacy was highest where it was the initial emphasis.

13. The initial emphasis on home-and-family did not result in higher achievement in that circle with respect to home-and-family targets.

14. The initial emphasis on felt-needs resulted in a higher percentage of agricultural changes than of any other type.

15. If there was any advantage in stressing literacy in the beginning, the period of this experiment was too short for that advantage to become apparent.

16. It was not possible to establish any correlation between the various categories of workers and the methods of approach used.

17. Couple units tended to be more able to adjust themselves to the various methods of approach than all the other categories of workers.

It may be argued that the conclusions reached by a single study in a particular portion of the country cannot automatically have general validity. But it must be admitted that while changes and modifications may be necessitated by further research, the conclusions reached by the Allahabad study do provide a better basis than has hitherto been available of knowing what qualifications to look for in future **Gram Sevaks** and what approach to adopt in any scheme aimed at rural development. As such they are an invaluable guide for all associated with the extension programme.

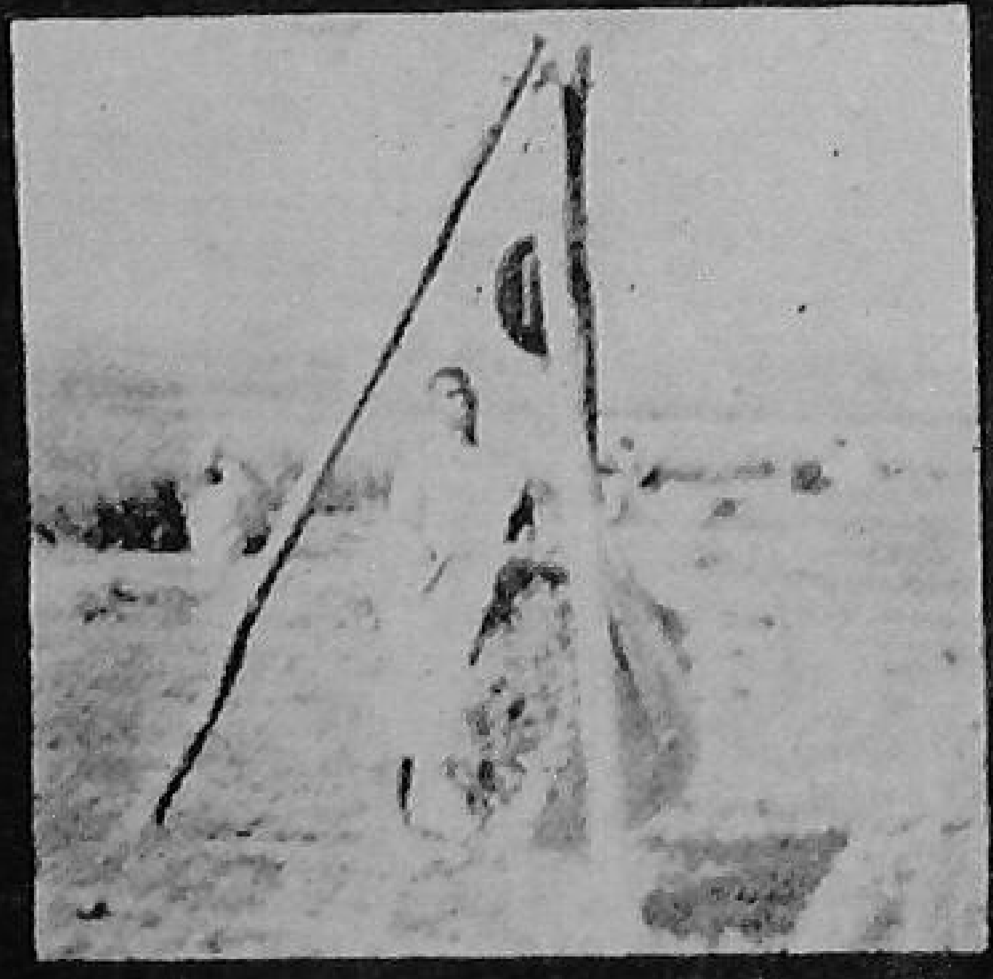
OUR COVER

It has been estimated that the introduction of improved varieties alone can increase crop yields in India by 15 per cent or more adding substantially to the income of the farmer. Distribution of improved seed is one of the most important tasks assigned to a *Gram Sevak*. Here a *Gram Sevak* trainee is seen inspecting an ear-head of an improved *Bajra* strain.

Photo—Gurcharan Singh

Improving India's Crop Production

—GEORGE H. DUNGAN



Dr. George H. Dungan, author of this article was on the faculty of the University of Illinois for more than 35 years, where he specialised in teaching and research on crop production.

Dr. Dungan's principal assignment in India was to collaborate with the Allahabad Agricultural Institute's Department of Agronomy on field crop experiments. But he also taught a number of courses, served on committees, wrote articles for publication, judged exhibits at village fairs, assisted with extension demonstrations, and served as leader of the University of Illinois group at Allahabad.

Dr. Dungan's article, which forms extremely interesting reading, dramatically shows the intimate connection between research and extension and how the two are inextricably interwoven in the successful implementation of any programme aimed at increasing agricultural production. It includes ideas and suggestions which must obviously be adopted if the Indian extension programme is to be successful and should, therefore, be helpful to the extension workers in this country.

On the morning of June 8, 1953, Mrs. Dungan and I locked our house in Urbana, Illinois, and started for India. We had been invited to accept a two-year assignment to the Department of Agronomy at the Allahabad Agricultural Institute (AAI).

(*Left*) Cutting oats for green fodder

(*Right*) The fourth oat crop in one season being harvested with a bullock mower.

Friendship between the United States and India has a long history. For nearly a hundred years churches of all denominations have been serving India in technical ways, as well as presenting Christianity to the people. The Allahabad Agricultural Institute itself was established as part of such a programme. In operation since 1912, it was officially founded in 1910 by the Foreign Missions Board of the Presbyterian Church under the leadership of Dr. and Mrs. Sam Higginbottom. Its primary function was, and still is, teaching young people the theory and practice of modern agriculture in Christian environment.

The Institute is located across the River Jumna from the city of Allahabad in the State of Uttar Pradesh. It is affiliated with the University of Allahabad, which grants Bachelor of Science degrees to the qualified graduates of the Institute.

In addition to teaching, the Institute does extension work in about400 villages within the radius of 30 miles of Allahabad, and it trains extension leaders who go out to serve in all parts of the country. The Institute also operates about 400 acres of farmland and carries on research in a number of lines.

We Join the Institute Family

We were accompanied on the 13-hour trip from Delhi to Allahabad by Dr. Ruth Wright and her husband, Russell Wright. Only three hours of the trip from Delhi to Allahabad were in daylight. We made the most of this short time by taking in the scenes from the car windows. The monsoon rains had begun and the countryside was thoroughly soaked. Thus we had our first sight of farmers ploughing fields completely under water, and were impressed by the zeal which these farmers displayed.

A large crowd from the Institute was at the station in Allahabad to meet us. We learnt later that coming out enmasse to welcome new staff members is a tradition at the school. It was a very pleasant experience, but to have it happen without any warning was a bit overwhelming. This warm welcome, as well as the unanimous concern for our welfare after we arrived, made us feel from the very start that we were part of the Institute family.

Throughout the two years that Mrs. Dungan and I remained in India, we enjoyed a rich personal experience and a close association with our colleagues from America and with our new-found friends in India.

My Duties are Varied

No instruction had been given as to my duties at the Institute; I had freedom to exercise judgment concerning the work to be undertaken. The main factors that were to shape my programme were requests made

by the administrators of the Institute, suggestions from my new associates, and my own initiative and personal promptings originating from past experience and adapted in the light of what I saw.

Soon after I arrived, I was asked to teach certain courses. I also substituted for teachers on leave and assisted others by giving occasional lectures. Although extension was not a part of my regular programme, I did share a little in the work of adult, nonresident teaching. Quite naturally, perhaps, I acquired membership on various committees, and in that way entered into the regular and extracurricular work of the Institute. I was called upon also to assist with several publications designed to aid in promoting the work of the Institute and the improvement of agriculture.

My particular professional work, however, was with the Agronomy Department in experiments with crop production.

What Should Our Work Accomplish ?

Those of us assigned to India on a programme to technical assistance were faced at once with the problem of how we could best fulfil our function. In other words, what form should the technical assistance take?

India has much scientific work underway. Of course, she does not have as many scientists per capita as the countries of the West, but she does have men well trained in all fields of science, and her best scientists compare favourably with the top scientists of other countries. So, as I interpreted my mission to Allahabad, it was not to plunge into a highly technical programme with the purpose of pushing back the frontiers of scientific knowledge, but rather to put science to work.

India's annual food production is never great enough to provide her 370 million people with the calories needed to meet the accepted standards of good nourishment. In some years production is not even enough to prevent actual starvation. Yet the farmers of India cannot afford heavy cash outlays to increase their production.

Facing these facts, we talked with our Indian colleagues at the Institute about what our programme in agronomy should be. We were of one mind from the start that we should pursue ways and means of increasing food production. The Department had been doing some of this all along. It had been helping farmers to select better-yielding varieties of crops, showing them the value of nitrogenous fertilizers, and giving them the results of tests on spacing of rows. We felt that we should do other practical things and make the results of our field trials available to the extension people and, through them, to the village farmer. We also agreed that, insofar as possible, we should select improved practices which required little or no cash outlay.

Sowing for Increased Yields

My first week in India, Mr. Henry S. Azariah, Principal of the Institute, asked me to recommend the best method of optimum rate of sowing field crops. This was quite an assignment for a person from a temperate climate who had suddenly come to the tropics. To get an answer to the question, I gleaned the Institute library for information and held conferences with members of the

This threshing method gives an accurate measurement of the yield, but is slow and tiring

Agronomy staff, including W. B. Hayes, acting head of the department, N. S. R. N. Dey, A. K. Ghosh, and R. P. Singh. We also received help from A. N. Singh and M. Siddiqui, who were assisting Mr. Azariah in the management of the farm. Together we prepared a report, but none of us was satisfied that our recommendations were entirely correct. We felt the need of local tests to give us the right answers.

Accordingly, R. P. Singh and I began testing different rates of sowing wheat, as well as various spaces between rows. Using the popular variety, Kanpur 13, we tried four rates of sowing: 40;60;80; and 100 pounds of seed per acre. Four row spacings were also used i.e. 6; 9; 12; and 15 inches. This experiment was continued during the two years I was at the Institute.

Good yields were obtained, because Kanpur 13 is a high yielding wheat and the plots were irrigated. The plots averaged more than 40 bushels of grain and 2·5 tons of straw per acre. The average yield of wheat in India for the seven-year period, 1947-1953, was 8·5 bushels per acre.

Strange as it may seem, rate of sowing did not affect the yield. The 40-pound rate produced just as high yields as any of the others. We concluded therefore that on productive soil and under irrigation the farmer might as well economize on seed by sowing at a 40-pound rate. When seeded at a thin rate, plants grew taller and ripened a little later than the plants growing in heavier populations, but these are not important matters to the farmer.

As to distance between drill rows, the results showed an advantage in favour of narrow rows. Sowing in 6-inch rows usually is not practical because of mechanical difficulties; nevertheless it gave the best results in both years. Average grain yields in bushels per acre for the 6, 9, 12, and 15-inch spacings were 46·9, 44·1, 41·8, and 38·4, respectively. Height of plants and time of ripening were not affected much by distance between drill rows.

Direction of Planting Affects Yields

According to reports from J. W. Pendleton, University of Illinois agronomist, oats yielded better when grown in rows running north and south than when grown in rows running east and west. Since we were looking for economical ways of increasing crop yields, we quickly accepted the direction of sowing row crops as a proposition worth trying out. The same Sun shines in India that shines in Illinois, and crop response to its rays should be the same anywhere. U. S. Sisodia, G. D. Singh, and I, therefore, gave direction of planting a trial.

We first tried maize grown for fodder. Fourteen plots were planted; in seven of them the rows were north and south; in the other seven, they were east and west. The rows were 24 inches apart. Fantastic as it may seem, north-south rows were 11 percent taller, 13 percent higher in grain yield, and 20 percent higher in yield of fodder than the east-west rows.

The *malabasa* (one-row seeder) consists of a shovel behind which is an iron tube with a funnel at the top. Seed is sifted through the fingers of the sower into the funnel. Generally a woman does the sowing job

Encouraged by the success we had with maize, we introduced direction of sowing into the experiment we were conducting on rate of sowing and distance of spacing wheat. In this trial, too, we got higher yields of grain from drill rows running north and south. The difference for direction was greater for drill rows 15 inches apart than for rows closer together. The crop in north and south rows did not mature as early as the others.

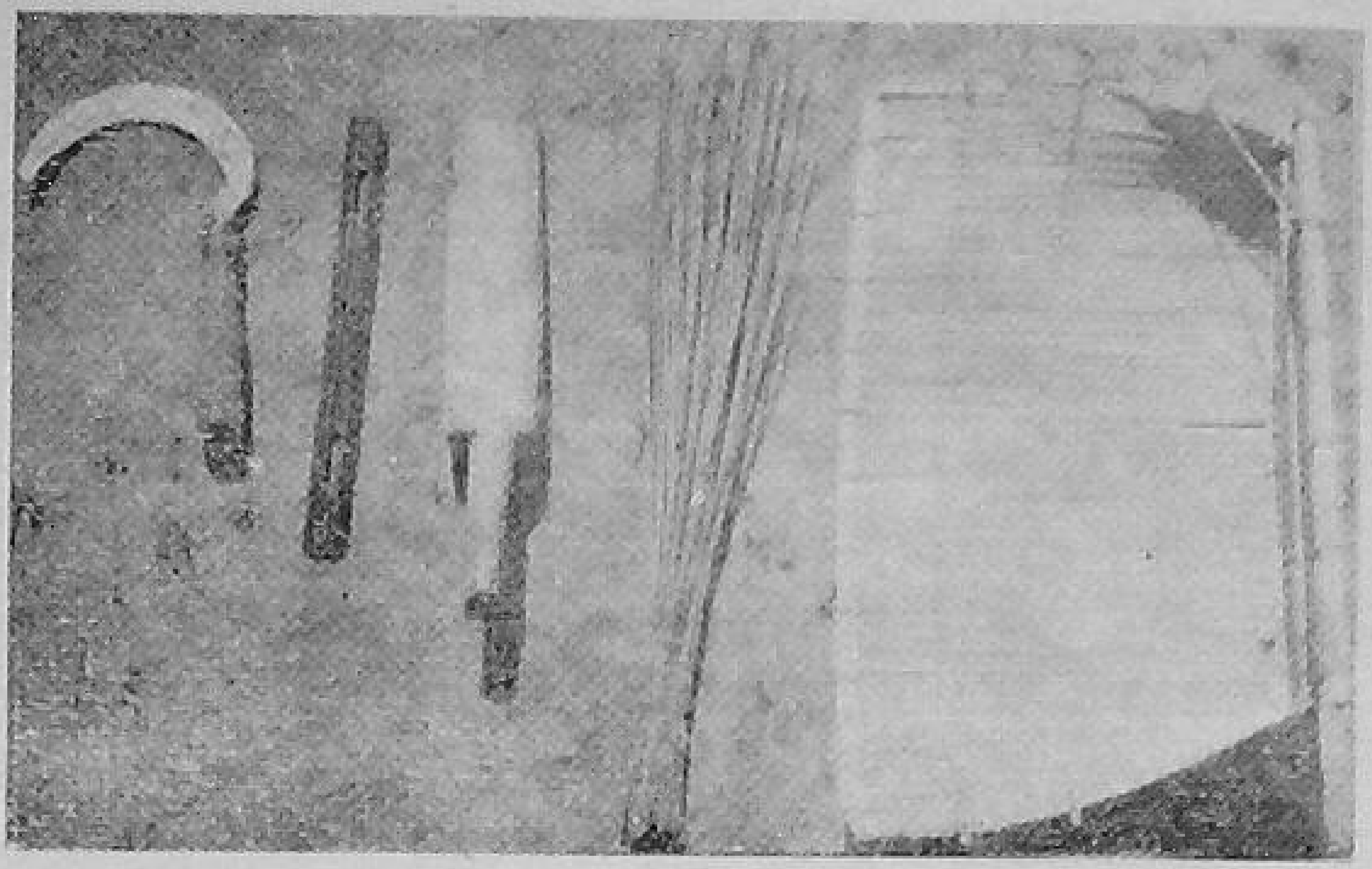
These results were so convincing that we advised farmers on level land to sow their row crops north and south. Since this practice would involve no extra cost, we considered it a safe recommendation.

Pressing the Soil Over the Seed After Sowing

One day, while looking over a nonirrigated field of wheat on the farm, a group of agronomy students and I observed that the drill rows differed markedly in height and thickness of plants. Moreover, the variations occurred in a regular pattern: one thick tall row, then two thin short rows, another thick tall row, two more thin short ones, and so on throughout the field.

I asked the class for possible explanations, but none that they offered seemed entirely adequate. Finally, we went to look at the drill which had been used for sowing the wheat. It was a three-row drill with spouts one foot apart. The wheels on either end were one foot from the outside drill. In sowing, the operator drives the bullocks so that one wheel runs in the last-seeded row, thus firming the soil over the seed. The regularity of the two thin rows followed by one thick row suggested that the compaction of the soil over the seed was responsible for the better germination and taller plants in the superior rows.

When the plants were ripe, R. P. Singh, A. N. Singh, and I determined the yield on the basis of 20 randomly chosen samples from thick and thin rows in two fields. In yield of both grain and straw, the thick rows exceeded the thin ones by a litlle over 35 percent. This led to the conclusion that on nonirrigated fields firming the soil over



Equipment used for harvesting and threshing grain at the Institute

the wheat seed at sowing time was very beneficial. However, in a planned experiment the next year the wheat in the firmed rows was no better than in the other rows. Why this difference is not clear, but the field was exceptionally dry the second year, and it is easy to believe that the drouth was responsible. It seems that the moisture content of the soil must be at a certain level if compacting the soil over the seed is to do any good. It should be pointed out, however, that firming the soil did not reduce the yield. It thus appears to be a safe practice, because it promises gain and certainly does no harm.

Growing Wheat on Dry Land Poses Problems

Lack of water is generally considered to be the most important single cause of low yields of winter-grown crops of India. The Indian Government is building dams, diverting streams, drilling wells, and constructing water-retaining ponds to increase the water available for irrigation. Nevertheless, most of the small grain in India is still grown on dry land. And even a casual observer can see that wheat and barley plants growing on non-irrigated fields become fewer and fewer as the season advances, so that the yield cannot possibly be very high.

Plant Population Studied

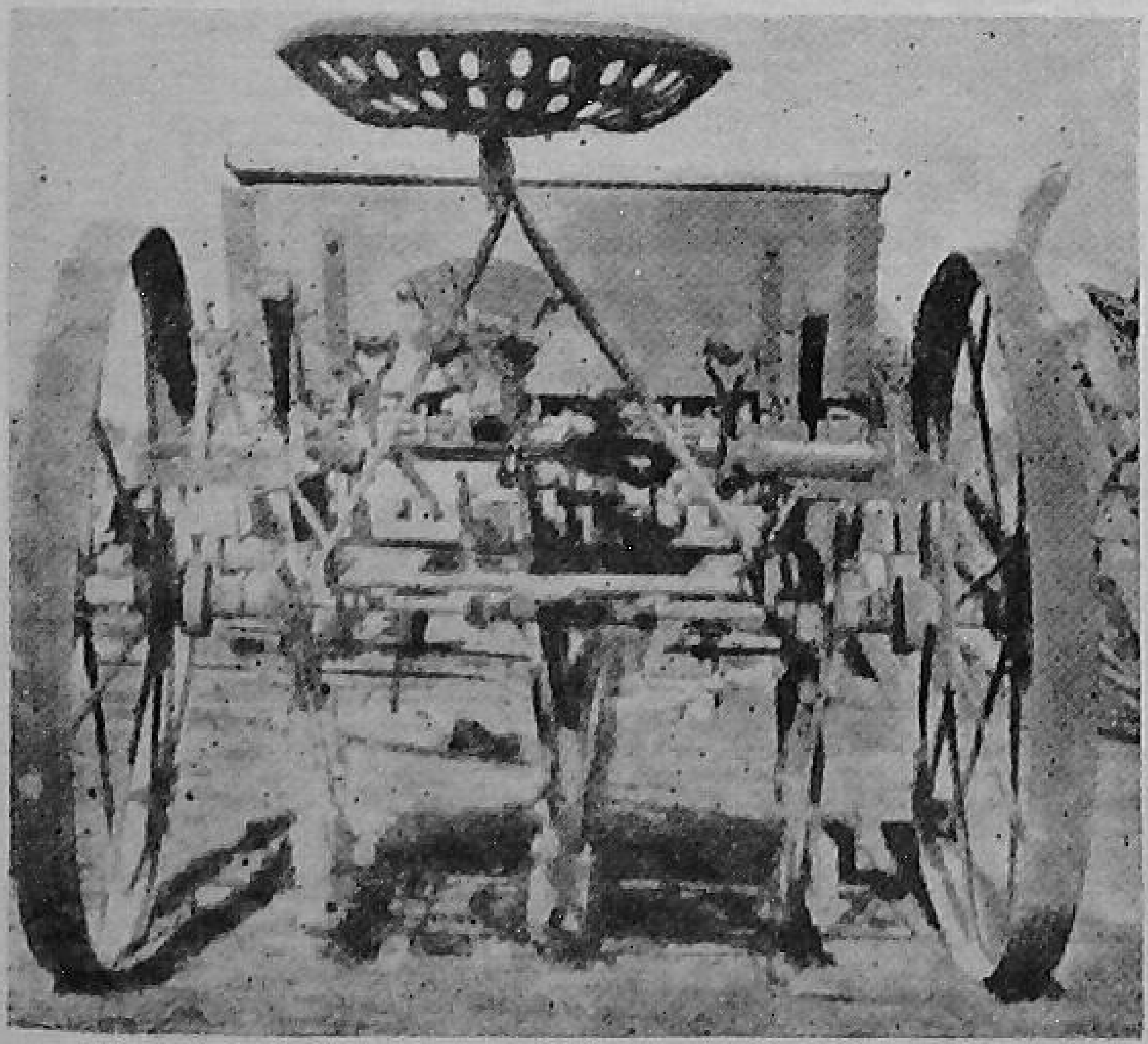
Since firming the soil after sowing wheat did not give any positive results in the second year experiment, R. P. Singh and I decided to change this experiment and study the

shift in plant population during the growing season. We made plant counts 13 days after sowing and at regular intervals until harvest. The population of living plants declined very markedly between counting dates.

Even at the beginning of the season, the stand was thin — only 174,500 plants an acre. Because of insufficient moisture, not all of the seeds germinated. Samples of soil taken near vigorous seedlings 13 days after planting contained $7\frac{1}{4}$ percent moisture. Soil near slow-growing plants contained $6\frac{2}{3}$ percent moisture, and that around ungerminated seeds contained only 3 percent moisture. By 1st December, 20 days after sowing, some of the plants had wilted and died. Soil samples from the root zone of wilted and dying plants contained $6\frac{1}{4}$ percent moisture, while samples taken near vigorous plants contained $7\frac{2}{3}$ percent moisture.

An examination of the dying and dead plants showed that the bases of their stems were brown. Dr. J. C. Edward of the Biology Department diagnosed the trouble as a foot rot caused by a species of *Rhizoctonia*. Some of the dead plants had been cut off below the ground by termites, but it appeared t\hat the termites had attacked the plants after they were dead or nearly dead from foot rot.

The back of a three-row grain drill used for sowing wheat



Yields Vary Directly With Number of Plants

Although yields were generally low, they varied directly with the number of plants in a row. The 176 rows, each 25 feet long, were divided into four categories, depending on the number of plants per row. The lowest 44 rows had 0 to 21 plants per row and yielded at the rate of 3·3 bushels an acre. The second quartile varied from 22 to 29 plants per row and produced 4·8 bushels per acre. Number of plants per row in the third quartile ranged from 30 to 41, with an acre yield of 5·1 bushels. The highest quartile had 42 to 75 plants per row, which yielded at a rate of 5·7 bushels. Yield per plant declined somewhat as the number of plants increased, even though total yield went up.

Fungicides may be Partial Answer

From these limited observations, it appears that to maintain a stand of wheat, the moisture supply must be increased or the plants that have been weakened by lack of soil moisture must be protected from the fungus attacks. In discussing the problem, members of the agronomy staff agreed that, in another year, trials should be made with different fungicides applied to the seed before sowing.

Thus, all this preliminary trial did was to open up a problem without solving it. If some simple, inexpensive method could be found for maintaining a full stand of plants from germination to maturity, it would benefit the dryland farmers very much, and, if widely used, would greatly increase the food resources of the nation.

Fertilizers More Than Pay For Themselves

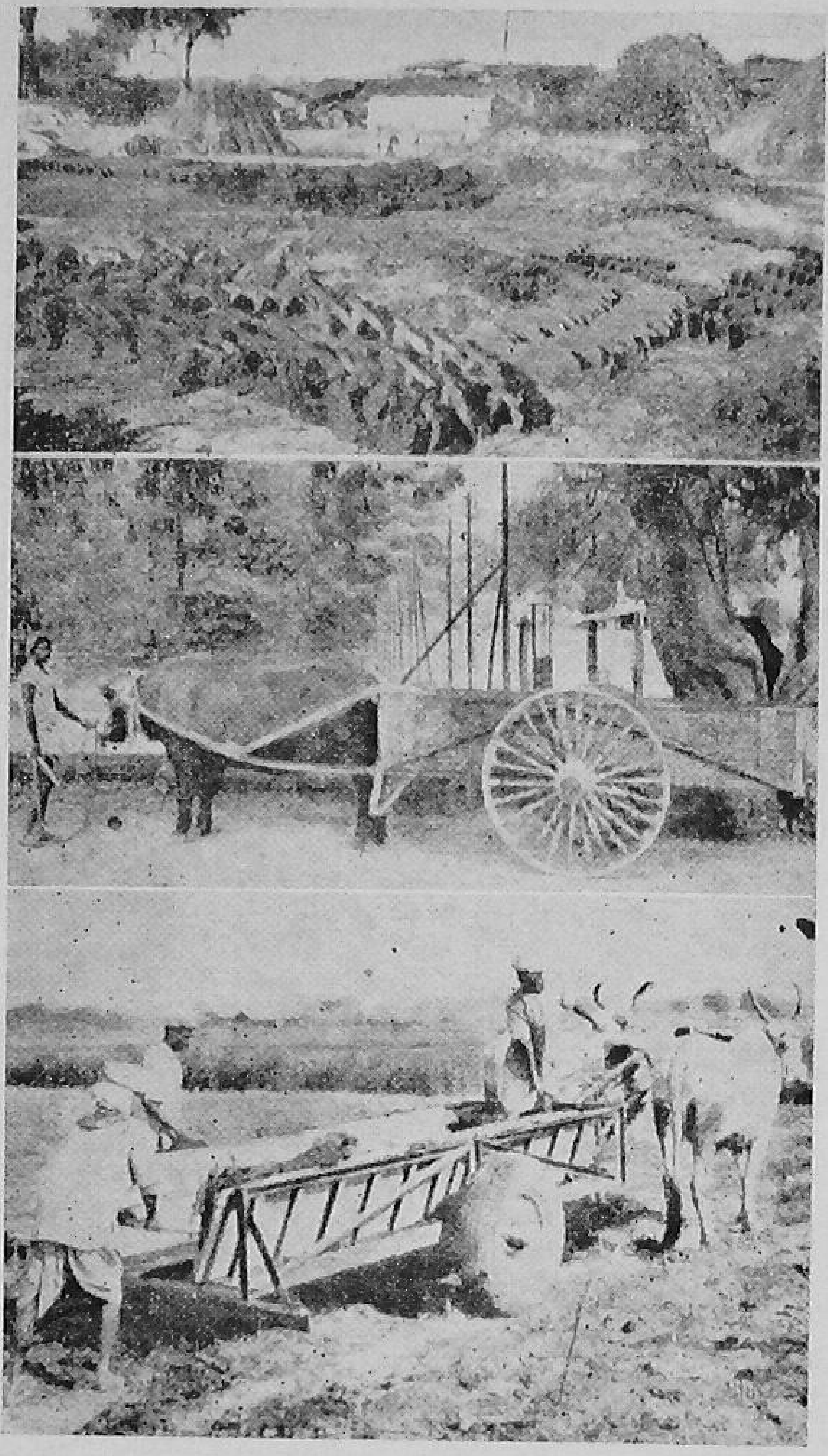
Next to lack of water, low soil fertility is considered the most important factor limiting crop yields. India has been an agricultural country for thousands of years and her programme of fertility replenishment has not been sufficient to maintain the productivity of the land. In many areas the shortage of timber and the cost of coal have led to the use of dung cakes for fuel. As a result, the soil is low in organic matter, and crops show signs of nitrogen deficiency.

The agronomy staff at the Allahabad Agricultural Institute, of course, recognize that addition of nitrogen to the soil was necessary for high yields. When I arrived there, I found that A. K. Ghosh and R. P. Singh were project leaders of an experiment testing the relative value of different carriers of nitrogen for *jowar* (sorghum) and paddy. N. S. R. N. Dey was testing the benefit of nitrogen on potatoes, All results showed that nitrogen increased yields.

However, interesting reports were coming in from nearby villages. These villages were in an area where no farm manure had been applied to the land. Crop yields increased markedly after one application of nitrogen in a form such as ammonium sulphate. But the increase was much less after the second application. With repeated applications, the yield increases dwindled untill finally the area to which nitrogen was applied yielded less than that which had received no nitrogen. These results suggested that some other plant food element must be so low in amount as to limit crop yields very quickly after the nitrogen deficiency had been met.

Fertilizers Tested on Soil Experiment Fields

To test soil needs by crop response, we laid out two soil experiment fields near Indalpur Village. The total area consisted of about an acre which Professor Alexander released from a tract of land where he was planning to sow alfalfa. The fields were at some distance from the bullock stanchions and therefore little or no manure had ever been applied to them. Chemical fertilizers were applied as follows: (a) no treatment, (b) ammonium sulphate, (c) super phosphate, (d) potash, (e) ammonium sulphate with superphosphate, (f) ammonium sulphate with potash, (g) ammonium sulphate with magnesium sulphate, (h) superphosphate with potash, and (i) ammonium sulphate with superphosphate and potash. These treatments were in four replications on each of the two fields. One field was seeded with *berseem* (Trifolium Alexandrinum) and the other with the N. P. 720 variety of wheat. Both fields were irrigated.



(a) Dung cakes being dried for fuel at Indalpur village
(b) But at the Institute the farm waste is conserved and returned to the land
(c) Manure being spread in a field

First-year Wheat Responds to Nitrogen

The most significant result of the first year's test was the response of wheat to nitrogen. Not only were the nitrogen-fed plants larger and higher-yielding than plants not receiving nitrogen, but fewer of them were injured by termites. The following

figures show the average yield increase due to nitrogen:

	Grain yields Maunds	Grain yields Bushels	Straw yields Maunds	Straw yields Tons
Nitrogen treatment	24·9	33·8	46·4	1·90
No nitrogen	19·3	26·4	37·5	1·53
Difference	5·6	7·4	8·9	·37

The value of the increase of the yield due to ammonium sulphate, figured at prices current at the time, was Rs. 102 as. 4.

The ammonium sulphate cost Rs. 31 as. 11 leaving a net profit of Rs. 70 as. 9 an acre. Expressed in another way, ammonium sulphate gave crop increases worth three times the cost of the fertilizer.

Later Crops Show Need for Phosphate

The next year the wheat plots were fertilized again and sown to cowpeas, which were harvested for green fodder. Yields were highest on the plots that received superphosphate. After the cowpeas were harvested, the land was ploughed, treated again with fertilizers, and sown to Kanpur 13 wheat. This time the grain and straw yields did not vary much for treatment, but from early in the season, the wheat growing on the superphosphate-treated plots was visibly taller than on the others. Our observation was borne out when we averaged the heights of 40 plants in each treatment, with the following results:

Heights of plants in inches

With superphosphate		Without superphosphate	
NP	49·8	N	46·2
NPK ...	48·2	O	44·7
PK ...	47·8	N Mg ...	44·0
P	47·4	NK	43·7
		K	43·5

The wheat on some of the phosphate-treated plots lodged badly and this perhaps kept the plots from yielding as high as one would expect from their appearance. At any rate, there was some evidence that phosphorus was the element next to nitrogen in order of scarcity.

Green manure is also used to maintain soil fertility

On the plots sowed to berseem during the first year, jowar was planted the following summer, and then lucern was grown. Both berseem and lucern made their best growth on plots that had been treated with superphosphate. Calculated at the rate which G. D. Singh, Farm Manager, charged the Animal Husbandry Department for green fodder, the profit from the extra berseem forage produced on the phosphated plot was enough to pay the cost of the fertilizer six times. Twenty-eight rupees worth of superphosphate increased the value of the crop by Rs. 190 an acre.

Fields Test High in Pottassium

No crops showed a significant growth response for potash fertilizer. Soil tests made later by A. U. Thor, Agronomy Department, University of Illinois, showed that the soil contained an ample supply of available potassium.

Fertilizers Tried on Barley Without Irrigation

Since most of the small grain in India is produced without irrigation, it is highly important to know which fertilizers will do the most good under these conditions. An experiment was, therefore, set up with the co-operation of Mason Vaugh and Ernest Peter of the Department of Agricultural Engineering. Four different treatments were made on plots which were seeded to barley and which received no water except

rain. Here is what we found:

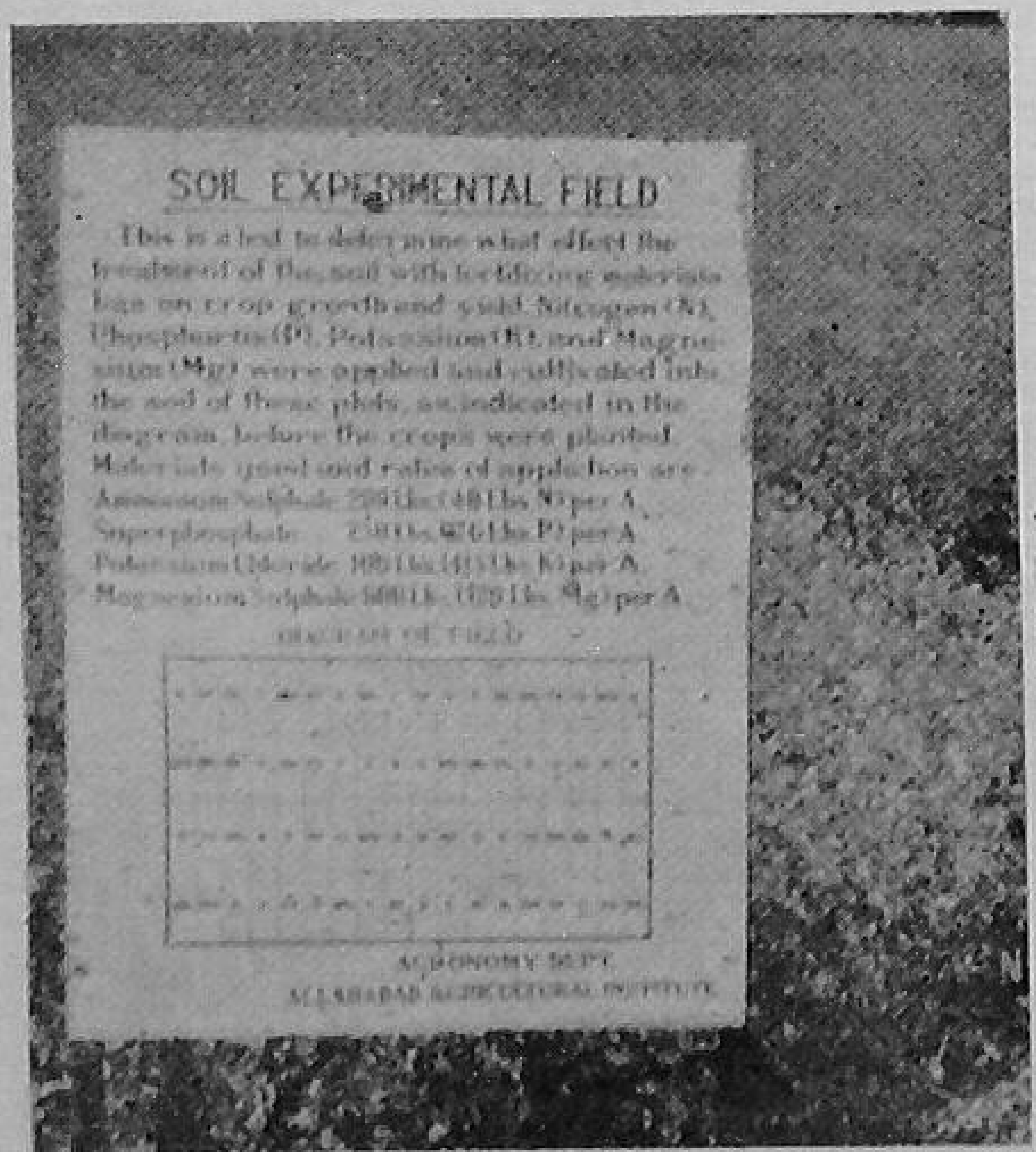
	Grain yields		Straw yields	
	Maunds	Bushels	Maunds	Tons
No fertilizer	7·5	11·0	11·0	·45
Ammonium sulphate	17·4	25·5	26·9	1·10
Ammonium sulphate & superphosphate	17·0	24·9	30·5	1·25
Ammonium sulphate, superphosphate and potash	21·5	31·5	33·5	1·37

All the increases in yield at current prices were worth enough to pay for the fertilizer more than two and a half times.

Weeds are Especially Serious in India

Weeds constitute a serious problem in any agricultural country. Through cons of natural selection, they have developed a very strong competitive power. Crops on the other hand, have been carefully husbanded by man for many years and have seemingly lost the capacity to do well under competitive situations.

In countries where the annual rainfall is concentrated in a period of a few months, the natural aggressiveness of weeds is greatly augmented. This is true at Allahabad, where most of the 40 inches of rainfall comes during the monsoon season beginning the last half of June and ending in the first half of October. The moisture plus the warm weather at that time cause weed seeds to germinate, and the soil is so saturated that it hinders the cultivation necessary to destroy them. All this, coupled with the practice of not killing the weeds just before crops are planted, can cause serious trouble.



A sign board made by the Extension Department

Farm leaders of the Allahabad Agricultural Institute have found that ploughing the fields during the dry season is a distinct advantage because the rough soil absorbs the rains readily when the monsoon starts and the clouds disintegrate quickly, forming a satisfactory seed bed without tillage. The farmer can sow his crop immediately after the first rain, thus getting the benefit of early seeding. This works well providing the farmer can cultivate his field right after he finishes sowing. If he cannot do this, the weeds get the upper hand and the crop plants are at a disadvantage from the beginning.

Once the weeds get a good start, it is often necessary to take them out with a *khurpi* (hand hoe), for cultivation will not satisfactorily destroy the large weeds. Since weeds have some value as fodder for cattle, village women are willing to take the weeds as pay for cutting them. This sounds like a good arrangement for the farmer, but it is not all good, because when weeds are big enough to yield fodder they have already seriously damaged the crop.

Cultivation Best Method of Weed Control

To get some information on different methods of weed control, A. K. Ghosh and I conducted a field experiment using maize in 1954. Frequent shallow cultivations, which removed all the weeds while they were small, gave the highest yield of ears and straw. Four cultivations were required to keep the weeds under control.

Pre-emergence spraying with kathon (2, 4-D) to take the place of the first two cultivations ranked next to four cultivations in yield of crop. Weed growth was less than one-third of that on the unsprayed plots.

Following are the yields of maize ears on plots receiving the various kinds of treatment.

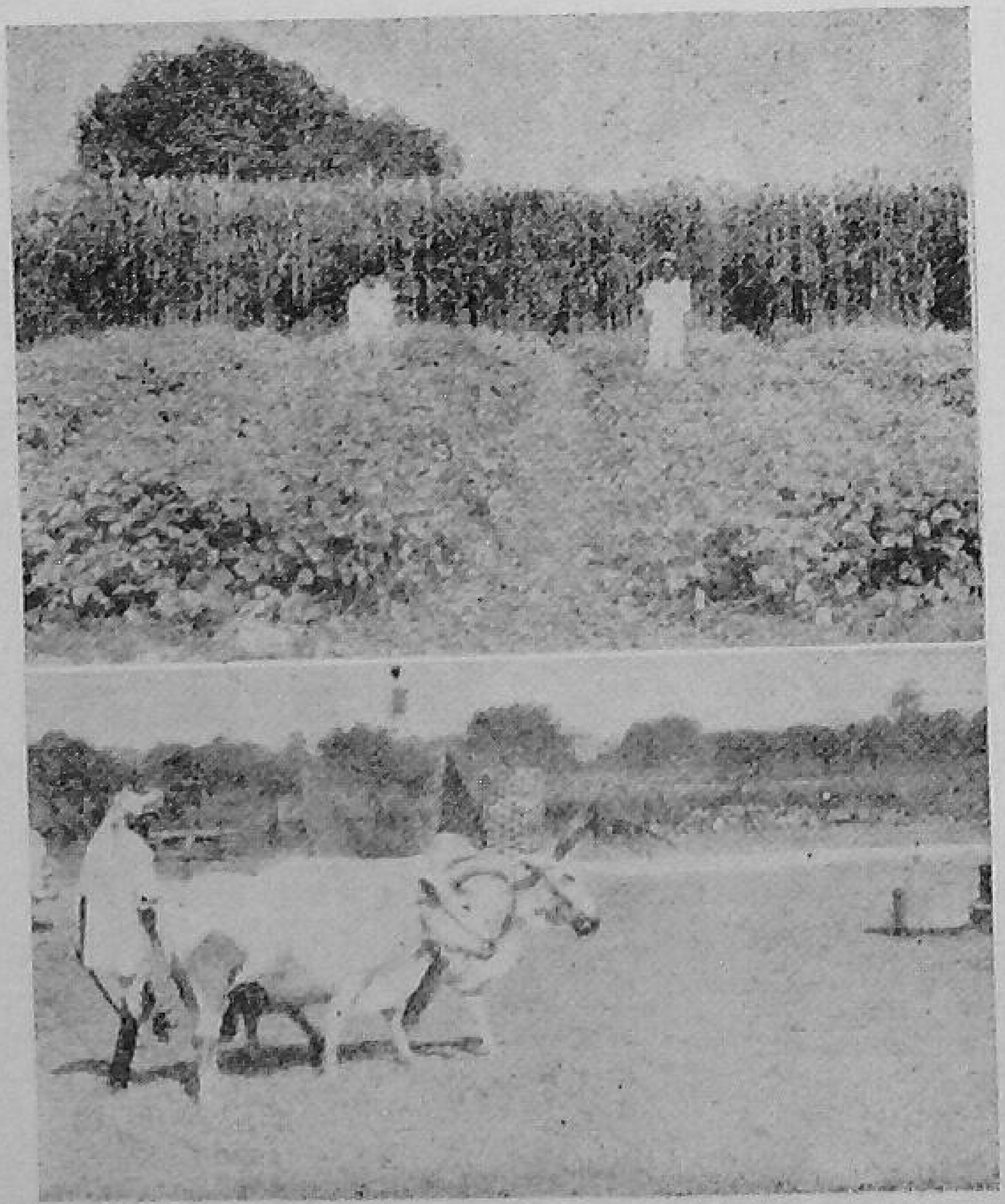
Treatment	Yield of maize in maunds per acre
No treatment	.. 12·3
Post-emergence spraying with 2, 4-D	.. 17·1
Weeded with a khurpi 26 days after planting, no cultivation	.. 19·1
Weeded with a khurpi 26 days after planting, one cultivation	.. 26.3
Pre-emergene spraying, two cultivations	.. 47·2
Four cultivations	.. 47·3

Soil Aeration Improves Crop Yields

As shown by the preceding figures, plots which were cultivated once after being weeded with a khurpi yielded 37 percent more than plots which were weeded only. This increase could not be attributed to weed removal, for there were no weeds on the uncultivated part of the weeded plots. We decided that it must be due to the better aeration of the cultivated soil.

We noticed, too, that while pre-emergence spraying held down weed growth fairly well, it also reduced the vigour of the maize. After cultivation the maize became dark green and grew rapidly, indicating the value of cultivation in promoting aeration as well as controlling weeds.

Soil treatment raised the yield of cowpeas at the Institute farm



The benefits of cultivation were also apparent on the Rain Fed Farm, operated by the Department of Agricultural Engineering. One day Mason Vaugh and Ernest Peter, in-charge of this farm, pointed out to me an area of excellent jowar, which was surrounded by small jowar infested with grass weeds. They explained that the good jowar was growing in a spot which had been reploughed in an attempt to kill kans (a pernicious grass weed). In other words, the land had been stirred immediately before the crop was sowed.

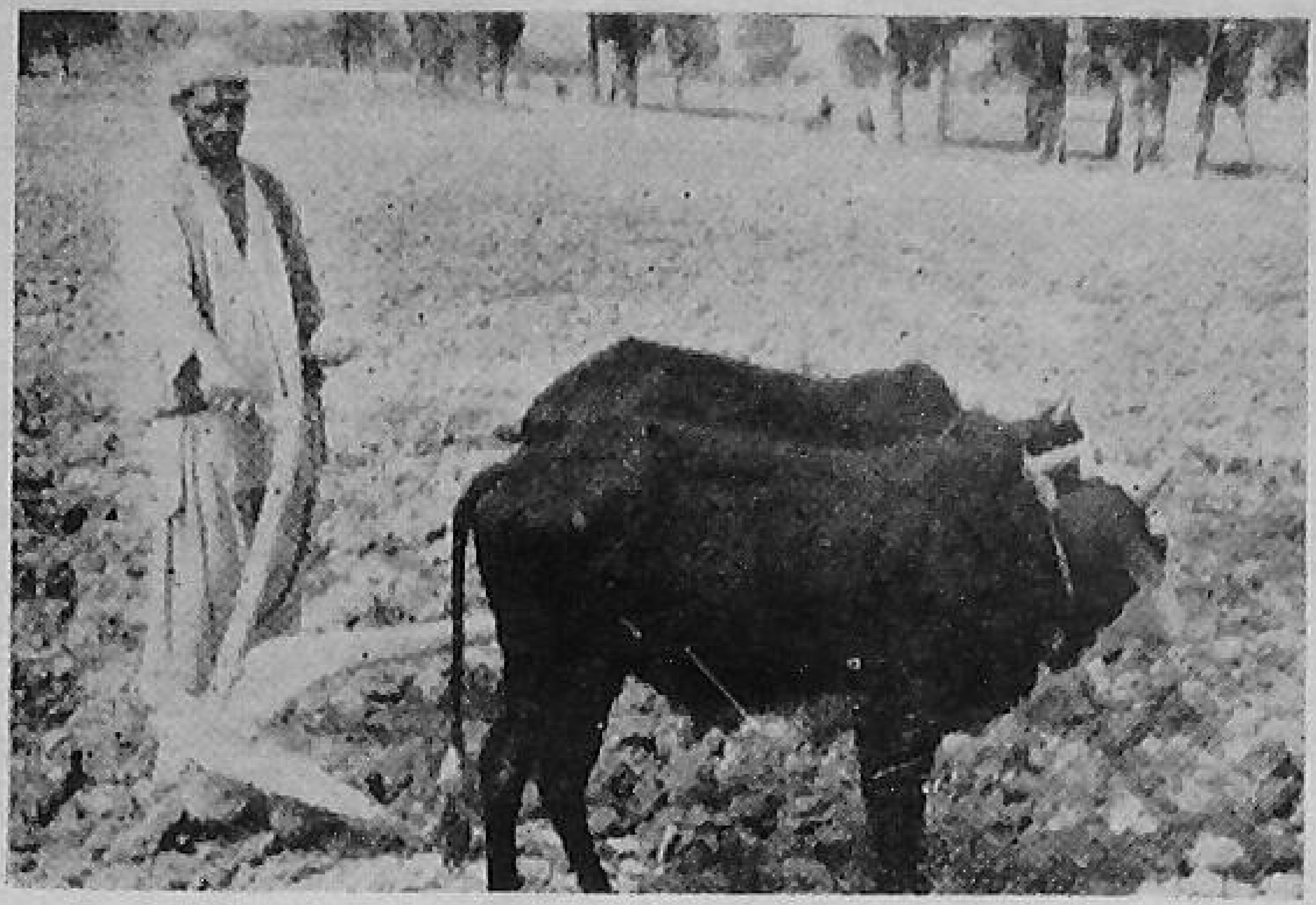
As Mr. Peter's request, I helped him lay out plots in this field and harvest areas for the determination of yield. The reploughed area yielded two and a half times as much green fodder as the area which had not been reploughed. Of course, much of this increase in yield is attributable to better weed control but I believe that part of it is due to the better soil aeration.

Experiments With Hybrid Maize

During the two years I was in Allahabad, my associates and I planted and harvested six crops of maize. Our work included the testing and developing of inbreds, and the testing of various hybrids and open-pollinated varieties.

Three days after I arrived at Allahabad, R.P. Singh. Data Din, and the other field men on the Agronomy Research Farm helped me plant small plots of 39 inbreds and 18 single crosses of maize. Mr. Azariah had given us permission to plough up part of a Jowar field to get some space for these plots. Our purpose in trying a large number of inbreds was to find the ones best suited to the region, so that we could use them in developing good hybrids for that part of India. Most investigators approach the problem the other way round, that is, they first try the hybrids and after selecting the best one propagate the inbreds needed to produce the proper single cross and finally the desired double cross. However, I thought that testing the inbreds should be the first step, since adapted and easily propagted inbreds were necessary for a hybrid to be practical in this new location.

All the lines included had been proved in the United States to have value as parents of outstanding hybrids. Of the 39 inbreds, 11 proved promising in the first trial both from the standpoint of adaptation and from the standpoint of ability to produce high performing, single-cross hybrids. These were K4, R75, R76, R78, R61, C103, 38-11, WF9, C.I. 21E, 1205, and K201C.



A *desi* plough at work

Developing Inbreds

Besides trying inbreds from the United States, we initiated a selfing programme to develop new inbreds from locally adapted varieties. We started by selfing plants chosen from commercial maize fields on the Institute farm. This particular project, however, seemed doomed for trouble. A 13-inch monsoon rain and a strong wind on August 20, 1953, washed off all the shoot bags, exposing fresh silks to wind-blown pollen. Later, jackals pushed over many of the plants and ate the inbred ears in the early milk stage. (The work of the jackals, incidentally, impressed upon us the need for a strong, tight fence around the experimental area.)

The selfing programme was continued, with better success than was encountered at first. The following local and introduced open-pollinated varieties were used as sources of germ plasm : Banda White Flint, Banda Yellow Flint, Evergreen White Flint, Fequisate Yellow Dent (Guatemalan), Guatemala 142-48 Yellow Dent, Israel White Flint, Jaunpur White Flint, Jaunpur Yellow Flint, O'Neill Yellow Dent, Philippine Yellow Flint and Sind Variegated Flint.

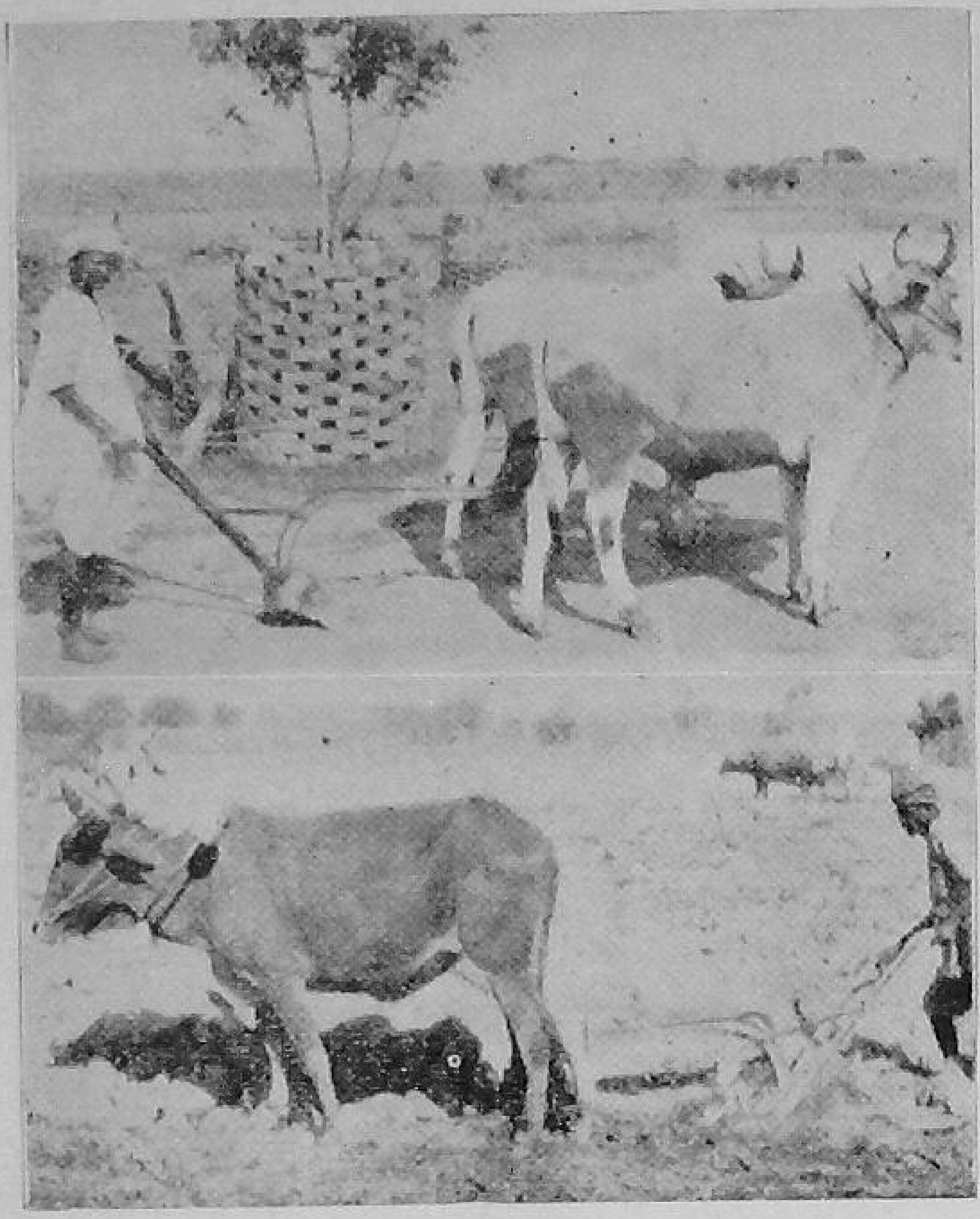
During the winter of 1954-55, 242 successful self pollinations were made. Some of these were advanced to the S_2 and a few to the S_3 generation. G. D. Singh made first-generation selfs in a number of local open-pollinated varieties and in a few of these he made S_2's.

Production of Hybrid Seed

A small amount of double-cross hybrid maize seed was produced on the Institute farm during the winter of 1954-55. The pollinator was the single-cross C103 × I205, and the ear parents represented 32 different single crosses which were detasseled for the production of double–cross hybrid seed. Not all of them did well, but some were very satisfactory, considering the conditions. The ones that proved best included K4 × R61, WF9 × B10, WF9 × J11, Oh29 × R61, R75 × R61, R4 × T8, WF9 × R61, and R4 × C.I.21E. Although the detasseling field was very small, it produced considerable seed of double–cross hybrids and also enabled us to demonstrate the method used by hybrid seed producers in the United States.

Shortly before I left the Institute, I turned over all our maize-breeding material to Dr. H.N. Mehrotra. He had recently returned from the University of Illinois, where he had earned the Doctor of Philosophy degree, using a maize-breeding problem for his thesis. Dr. T. A. Koshy, Head of the Biology Department, gladly gave Dr. Mehrotra permission to cooperate with G. D. Singh of the Agronomy Department on this project.

The transfer of the maize-breeding project to a well-trained person illustrates the two-way advantage of the International Cooperation Programme. Indians who come to the United States under this programme receive training and experience that qualify them to cooperate with the United States technicians stationed in India, to the benefit of all concerned.



Steel mouldboard ploughs used for turning under organic matter

Hybrids Promise High Yields

Several hybrids tested at the Institute promised to yield half again as much grain as the local, open-pollinated varieties, even though most of the inbreds were introduced from the United States.

Three plantings were made a year—in February, in July, and in October. The highest yield obtained during the two-year period was from a hybrid planted on October 20, 1954. It was a three-way hybrid made by crossing J11 (an inbred made by our staff in India from Jaunpur Yellow Flint) and R61 (an Illinois inbred made from a commercial hybrid and a Lancaster line), topped with WF9 (an Indiana inbred from Reid Yellow Dent). It produced shelled grain at the rate of 55·9 maunds (81·9 bushels) an acre. Ten other of the 17 hybrids in this experiment yielded better than the best open-pollinated variety, which produced 29·6 maunds (43·3 bushels) an acre.

The most unsatisfactory planting time proved to be February. High temperatures in early May during the tasseling and silking period prevented seed set and also killed many of the upper blades. At that time of year, the weather is so dry that the cost of irrigation needed for maximum growth is exorbitant.

Growing maize in winter is hazardous also, because of the likelihood of killing temperatures. During the two years I was at the Institute the minimum recorded temperature was 36° F. This was low enough to kill the blades of some of the entries, but most of them recovered enough to make a good growth and satisfactory yield. And, as already mentioned, we obtained our highest yield from a winter crop.

Other Methods of Increasing Production

Much interest is shown at the Institute in the trial of new crops and new varieties of old crops. Soyabeans, which have done so well as an introduced crop in the United States, have also performed well in India. In experiments conducted by G. D. Singh, the Pelican variety was twice as high-yielding as the other varieties tried and promised to compete well with cowpeas as a fodder crop on the farm.

Both coastal and Swannee Bermuda grass produced by Geenn Burton were much taller-growing than the native doob grass. Missouri 0—205 oats looked promising as a fodder crop and its seed is being increased for further trial. Of the 20 new flax creations supplied by J. O. Culbertson and Verne E. Comstock of the U. S. Department of Agriculture, Brawley 588 (Punjab 47xDakota) proved best with a seed yield of 13·8 bushels an acre. Brawley 5912 (Punjab 47x Dakota) was next with a yield of 12 bushels of seed. Brawley 445 and C. I. 795 (Selection 4) also yielded well, with over 8 bushels of seed an acre.

Hubam sweet clover proved well adapted to the soil and climate at the Institute. A planting made by U. S. Sisodia, using seed which Mason Vaugh got from Dr. S. B. Singh, Director of Agriculture, U. P., produced an excellent crop, over 6 feet tall, with a seed yield of more than 15 bushels an acre.

Because of Hubam's large yield of organic matter, it gave much promise as a green manure crop.

Harvesting a Bigger Potato Crop

In order to take advantage of the favourable market price, potatoes on the Institute farm were being harvested while the tops were still green. A. N. Singh, Assistant Farm Manager at the time, invited my collaboration in an experiment to determine the loss in yield from this early harvesting. We laid out a series of replicated plots, planning to dig tubers at 11-day intervals.

Between January 21, our first harvest, and February 1, the yield increased 20 percent. This increase amounted to 37 maunds or 50·5 bushels an acre, and was due to a 50 percent increase in the number of tubers measuring 19/16 inches or more in diameter. There was no increase in total number of tubers per acre. A light frost soon after the first of February and an attack of early blight disease killed the tops, thus ending the experiment.

The price of potatoes was so high early in the season that premature harvesting was economically sound but this simple experiment showed that letting potatoes reach full maturity before digging was a way to get the maximum amount of food from the crop.

Trapping Crows Increases Food Supply

The Allahabad community has a large population of crows. They constitute a menace to the farmer who tries to produce mature grain of maize, jowar, and bajra (pearl millet), and they also steal vegetables and fruits from gardens and orchards. According to Arthur A. Allen, in The Book of Bird Life, "crows require at least half their own weight of food each day merely to exist, and they can easily consume food equivalent to their full weight each day". The average grey-neck or house crow weighs about $\frac{1}{2}$ pound, which means he would consume at least 4 ounces of food a day.

Poisoning crows is difficult, and to keep a *chowkidar* (watchman) does no permanent good. He merely drives the crows from this employer's field to the neighbours' premises, where they arrive hungrier than ever because of the delay in getting food.

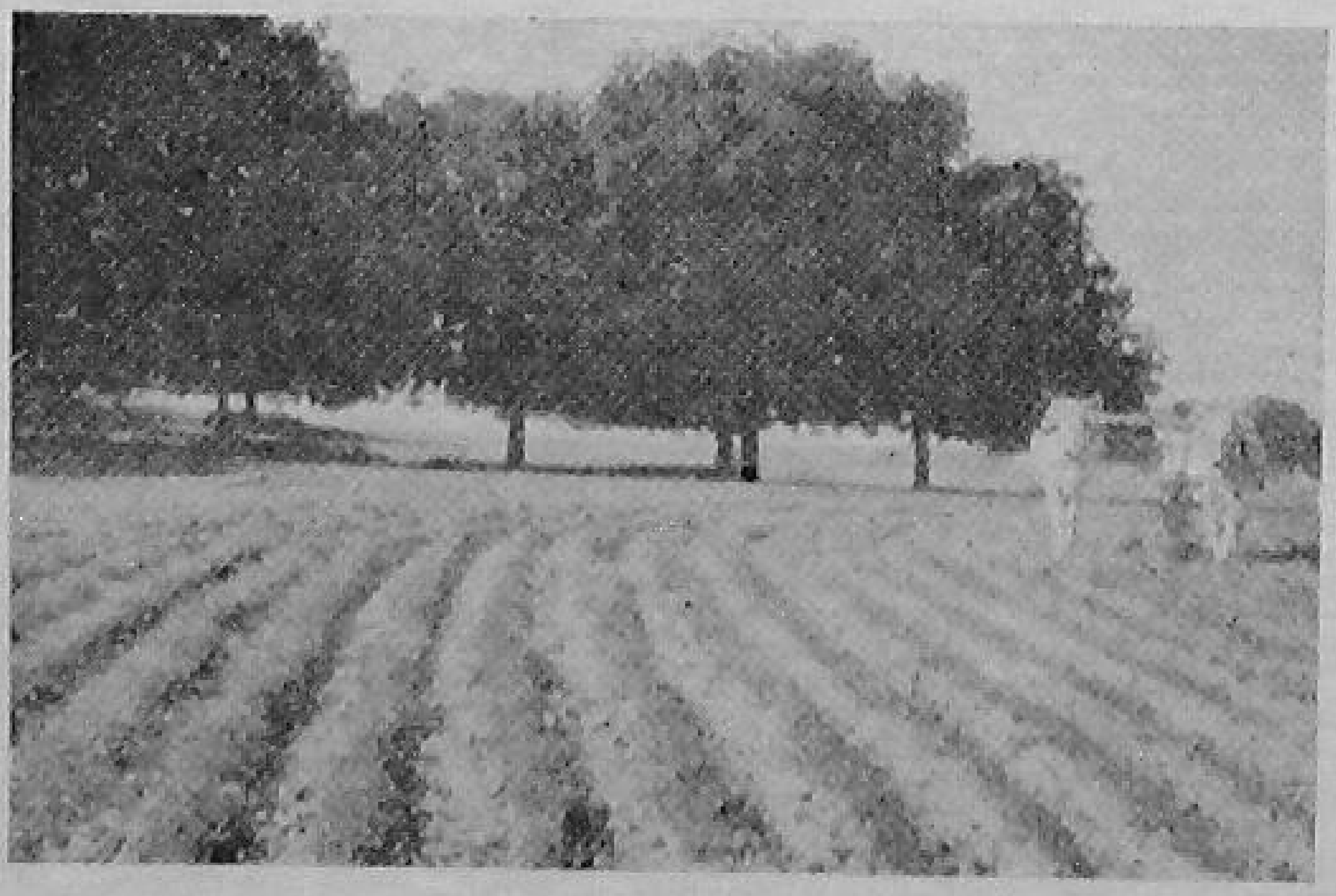
In an attempt to find a way of destroying crows, we asked P. C. Verma, Superintendent of the Institute Workshop, to build a trap modelled after the one described by Dr. E. R. Kalmbach in U. S. Department of Agriculture Farmers' Bulletin 1102. The trap consists of a wooden frame 10 × 10 feet on the ground and 6 feet high. It is covered with woven wire except for a strip, 18 inches wide across the middle of the top. Slats are tacked 6 inches apart across this strip, and it is between these slats that the crows enter the trap. An attractive bait is needed to entice crows to enter. A crow or two left in the trap as decoys will effectively attract other crows.

Ram Prasad Singh of the Agronomy Department was in charge of crow-catching operations. The largest number of crows he ever caught at one time was 38. All told, from September 1, 1954, to May 31, 1955, he caught 1,299 crows in this one trap. This represents an average of 144 crows a month. Obviously, if each of the 5,00,000 villages in India had one trap, the resulting increase in the food harvest would be immense.

New Research Plots and Equipment

The area that had formerly been assigned to the Agronomy Department for field research was some distance from the campus

Alfalfa in rows makes it easier to eradicate weeds



and was located on soil which varied in productivity and drainage. There was, however, a tract of land south and a little west of the campus that Mr. Singh favoured for agronomic research plots. For one thing, the topography and productivity were much more uniform than on the old area. Also, it was near enough to campus buildings and the plots could easily be used as a teaching aid, and visitors with just a short time at the Institute could get out to see them. We measured the area and figured out how we could arrange divisions and driveways. With a picture of the possibilities and well fortified with the advantages of the new location over the old, Mr. Singh presented his request to Mr. Azariah and the other members of the committee, who approved the request. In July 1954, therefore, we moved all of our field research operations in agronomy to the new field, except for a sugarcane project, alredy underway, which would take almost a year to complete.

A close-up view of the maize-breeding nursery

The driveways around the divisions are 18 feet wide. They provide space for turning farm implements used in working the fields and serve as roadways for visitors and students who come to see the experiments. They also protect the crops in other experiments from trampling.

The new field is now being used for all agronomy projects. These include the usual variety trials and a number of cultural experiments. In addition, a long time soil-fertility study has been begun. The use of fertilizers is increasing in India, and the village farmer needs guidance to use them wisely.

Hybrid maize

Indigenous open-pollinated maize

Two divisions of the field have been marked off for the fertility study. Four replications of eight plots have been laid out in each of the divisions. Individual plots are 36 × 9 feet with a minimum border space of 6 feet between plots. Every alternate border space is 9 feet wide to allow ample space for an irrigation channel along one side of every plot.

Since 1954, nitrogen, phosphorus, and potassium have been applied singly and in all possible combinations, with one plot in each replication being left untreated. Gas pipes have been sunk into the ground at the corners of the plots so that the area will be permanently marked and retreatments made on the same plots year after year in time. The unbalanced or balanced fertility programme followed on the various plots will be reflected in the character of the crops. If these plots are continued as planned for 15 or 20 years, the management practices followed will cause differences in the soil, which will be useful to the chemist in co-relating soil tests with crop yields.

Dr. J. C. Gideon, of the Department of Chemistry at the Institute, will be in charge of the soil testing. He has his Ph. D. from the University of Illinois, the research project for his thesis having been on improving the soil test for available phosphorus. He is, therefore, trained to follow the changes in fertility level on these plots and work out a system of soil tests which will enable the village farmers to buy both the right kind and right amount of fertilizer.

Summary and Evaluation

Some readers of this article may now wonder whether those of us who have participated in this programme consider it successful. I can of course speak only from my own experience.

As I interpret this programme, it has two general objectives: one is to help the people of other countries in technical ways, and the other is to promote international goodwill.

Let us consider the technical assistance first. As I mentioned at the beginning of this article, my colleagues at Allahabad and I considered that this should consist of developing improved practices which would increase India's food supply without adding to the cost of production. Here is a run-down of the things we did:

1. Pressing the soil over newly seeded wheat on dry land increased the yield by 35 percent.

2. Maize sowed in north and south rows yielded 13 percent more ears than that sowed east and west. Wheat also yielded better when planted north and south.

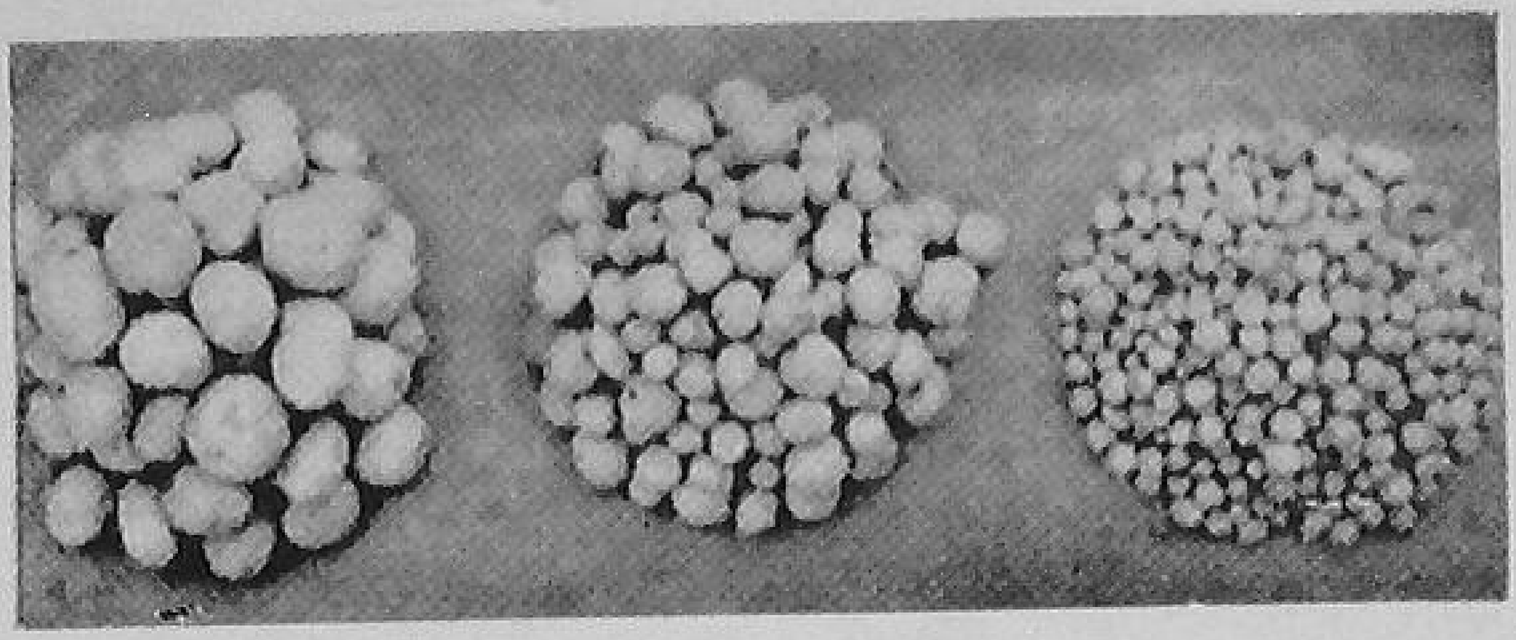
3. The yield of maize fodder was doubled by keeping weeds out of the crop from the beginning rather than weeding with a khurpi 4 weeks after planting.

In order to take advantage of a favourable market potatoes were harvested while the tops were still green

4. Hybrid maize in test plots promised to yield 50 percent more grain than indigenous open-pollinated varieties.

5. Use of fertilizers on wheat and legume crops under irrigation gave yield increases which paid for the fertilizer, and produced a nice profit besides.

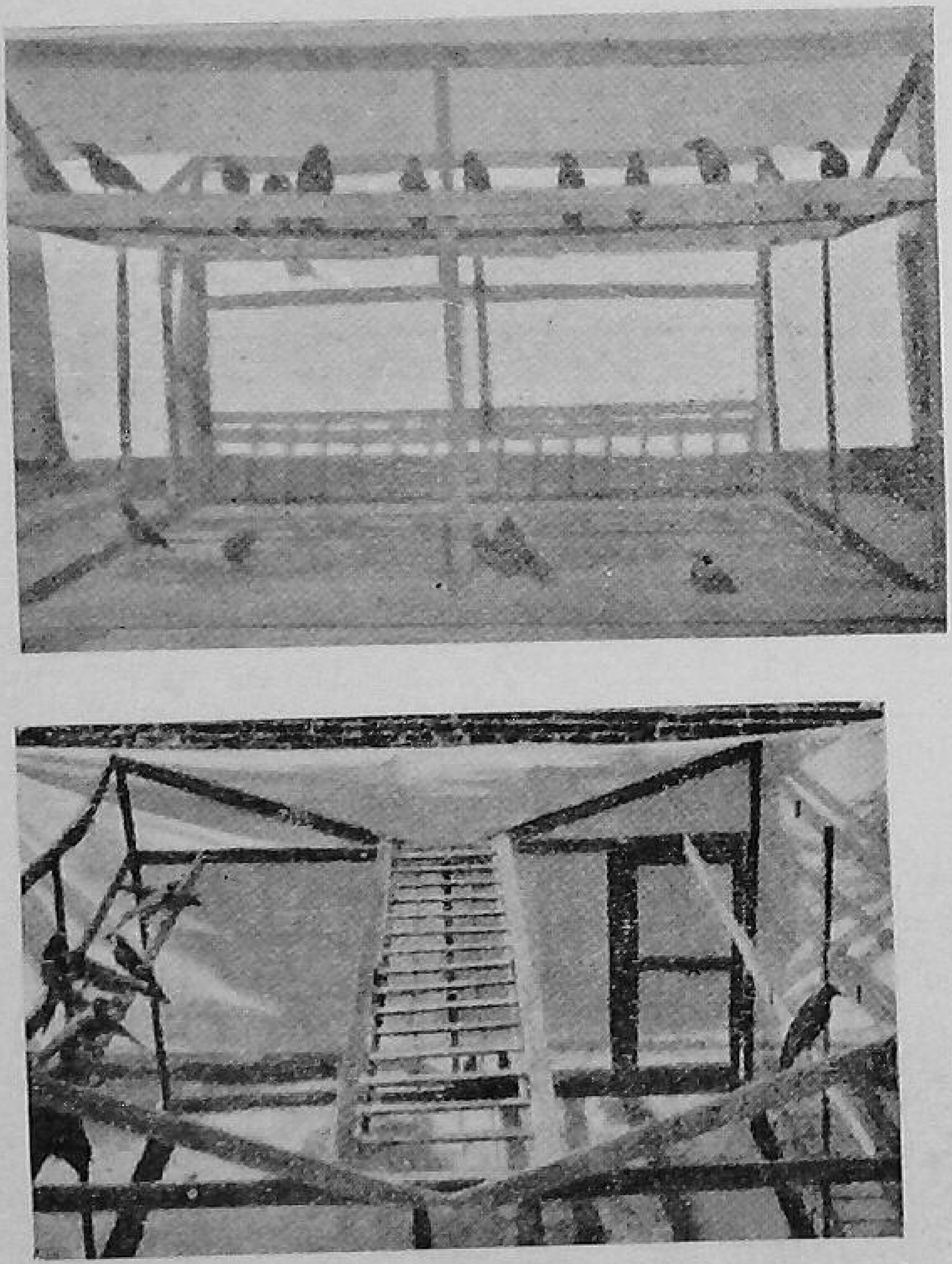
6. Harvesting potatoes 11 days before maturity to take advantage of the high market price for early tubers reduced the yield by 20 percent. Late harvest did not increase money income, but it did point the way to increasing the food supply.



Potato tubers graded into three sizes

7. Fencing out jackals and trapping crows increased the food supply available for human consumption.

These are all simple methods of solving India's food deficit. They involve the application of techniques that are generally known and used in other parts of the world.



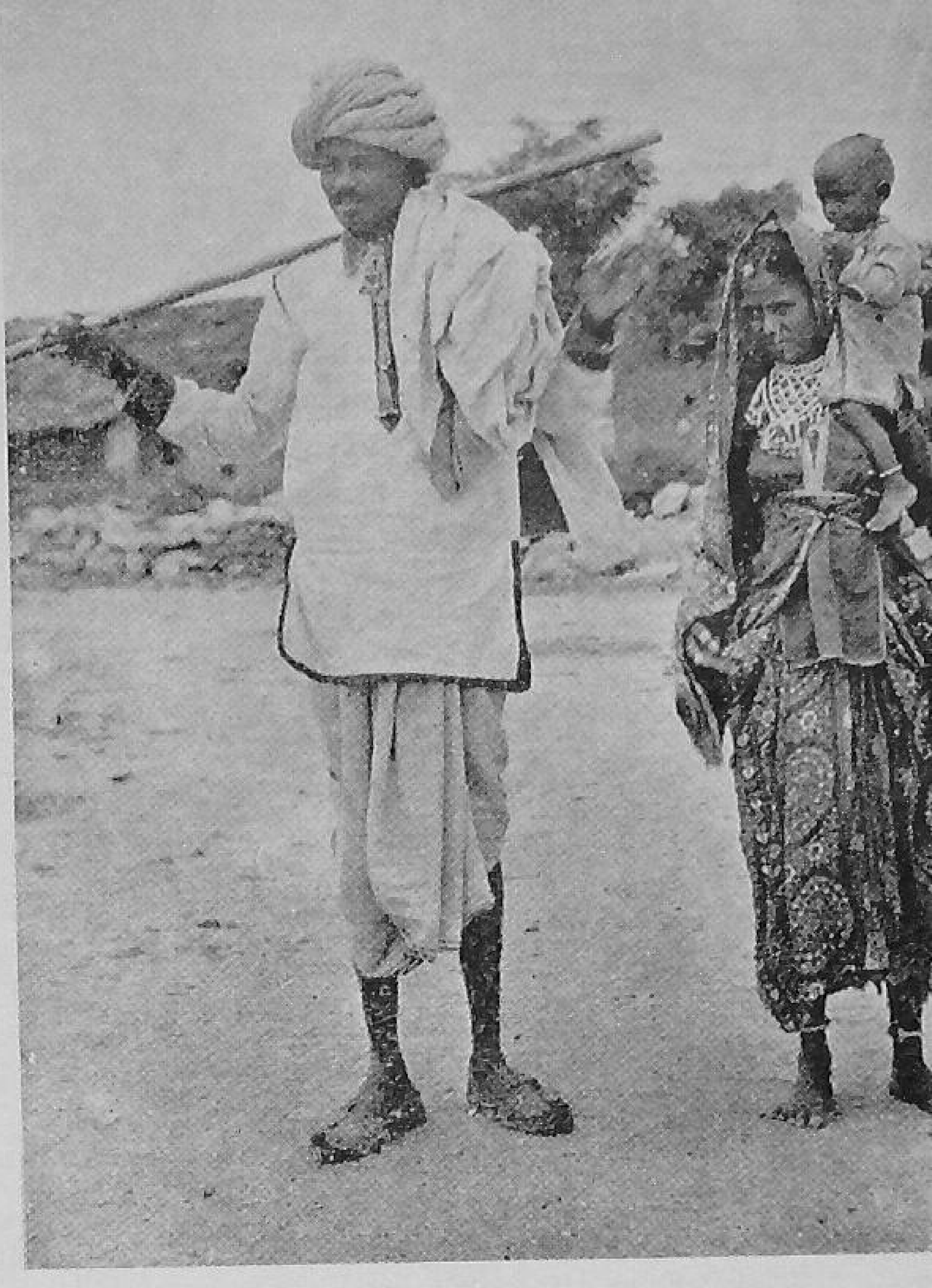
Crow traps

Now as to the goodwill part of the programme two people working on a project in which both are interested is an ideal set up for the growth of goodwill. That is what we had at Allahabad. In all the projects on the experimental plots the Americans had the helpful collaboration of one or more Indian colleagues. We discussed matters involving policy with the proper officials and sought the advice of experienced men on the staff before beginning anything new.

My experience in India gave me a feeling of high regard and genuine goodwill toward Indians in general and toward my friends and associates at the Agricultural Institute in particular. The high level of intelligence possessed by the Indian people, their skill in using limited equipment with marked efficiency, and their willingness to work hard at the job assigned them are assets distinctly in favour of continued growth in the economy of India.

Extension Programme and Training of Personnel

— D. M. ANAND



"This programme represents the new dynamism which is so essential to all progress. It means a social revolution in our ways of life and work which is creeping gradually but surely over the vast land of India".

In these memorable words the Prime Minister, Shri Jawaharlal Nehru, recently summed up the significance and role of the Community Development and the National Extension Service Programme, which has been in operation in the country for nearly five years. This programme infact is the very heart of the whole concept of a Welfare State which is enjoined on the Government by the Constitution of India.

For some three decades before the dawn of independence, rural development work had been undertaken by different branches of the administration in the various parts of the country. However, the expenditure on development was meagre and rural development work was thought of largely in terms of particular items of improvement in village life and in agricultural practice. Special attention was given, for instance, to the number of wells sunk or repaired, the supply of irrigation or drinking water, the supply of seeds or fertilizers, or the number of manure pits dug, starting of rural credit societies etc. These are essential items in any rural programme, but there was no coordinated approach to village life as a whole.

From the study of the various developmental efforts such as the extension programme in Baroda, rural reconstruction work by Dr. Tagore at Sriniketan and the similar work in the Punjab and at Martandam in Travancore-Cochin, as well as the experience gained in later years in Sevagram, in the Firka Development scheme in Madras, in the Sarvodaya centres in Bombay, in Etawah and Gorakhpur in Uttar Pradesh and other centres which are less well-known, certain broad conclusions emerged. The first Five Year Plan summed these up as follows:—

(i) When different departments of the Government approach the villager, each from the aspect of its own work, the effect on the villager is apt to be confusing and no permanent impression is created. The peasant's life is not cut into segments in the way the Government's activities are apt to be; the approach to the villager has, therefore, to be a coordinated one and has to comprehend his whole life. Such an approach has to be made, not through a multiplicity of departmental officials, but through an agent common at least to the principal departments engaged in rural work, whom it is now customary to describe as the village level worker or the *Gram Sevak*.

(ii) Programmes which have been built on the cooperation of the people have more chances of abiding success than those which are forced on them.

(iii) While the official machinery has to guide and assist, the principal responsibility for improving their own condition must rest with the people themselves. Unless they feel that a programme is theirs and value it as a practical contribution to their own welfare, no substantial results will be gained.

(iv) Programmes largely dependent on expenditure by the Government, in which the elements of self-help and mutual cooperation on the part of villagers are present only in a nominal degree, are shortlived. The essential idea should be the reduction of chronic unemployment, which is a feature of rural life—through the practice of scientific agriculture and cottage and small-scale industries.

(v) Advice and precept are of no avail unless they are backed by practical aids—supplies of seeds and fertilizers, finance and technical guidance for solving the farmer's immediate problems.

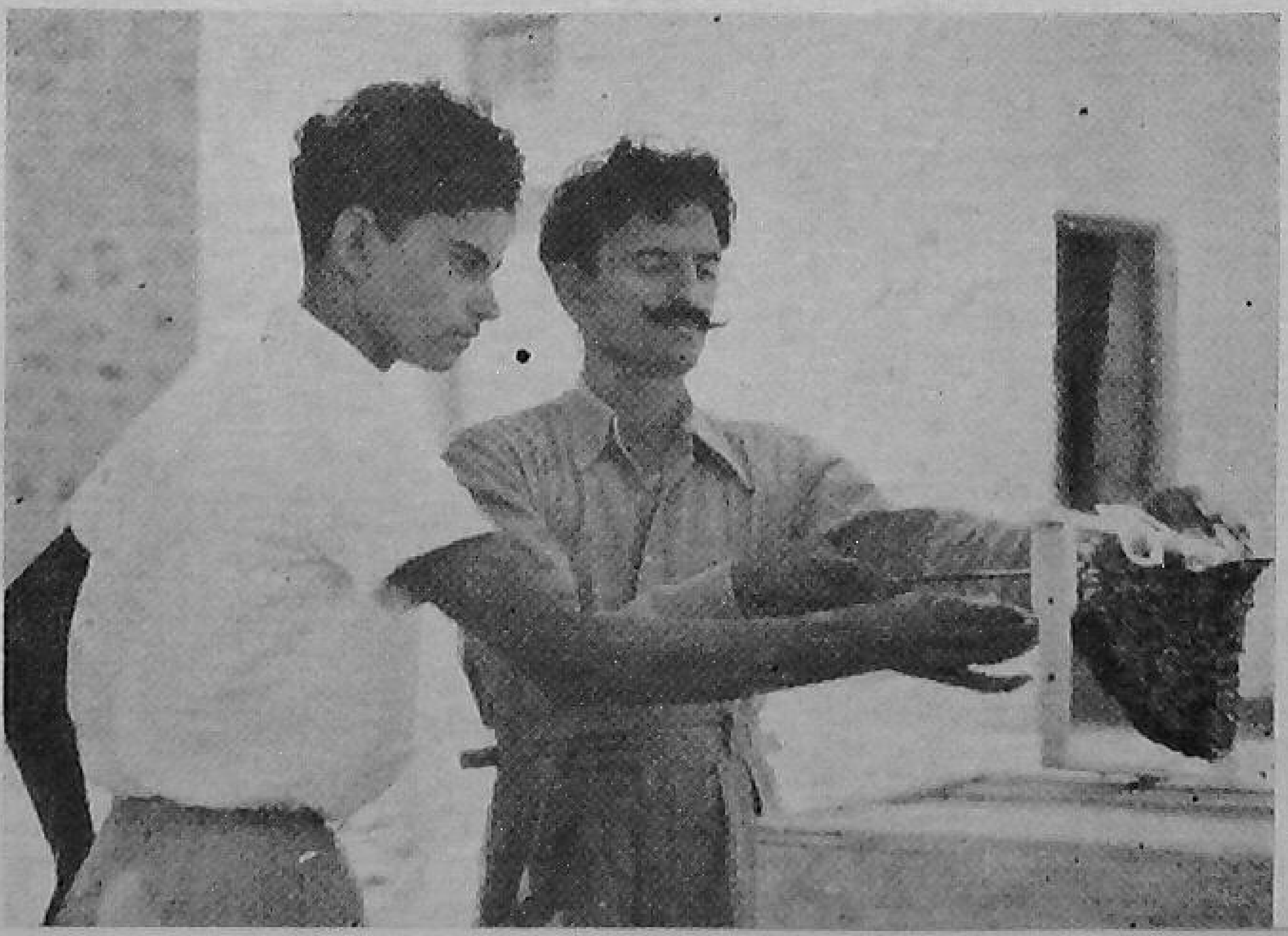
(vi) Whatever the measure of the effort which the Government wishes to make, the best results will be gained if the programmes are pursued intensively, and practically every agriculturist family has its own contribution to make through a village organisation.

(vii) The approach to the villager should be in terms of his own experience and problems conceived on the pattern of simplicity, avoiding elaborate techniques and equipment until he is ready for them.

(viii) There has to be a dominant purpose round which the enthusiasm of the people can be aroused and sustained, a purpose which can draw forth from the people and those who assist them on behalf of the Government the will to work as well as a sense of urgency. The aim should be to create in the rural population a burning desire for a higher standard of living—a will to live better.

These lessons from the experience of the past have been brought together the conception and concrete formulation of the whole extension programme in India and

Training in subjects such as bee keeping is given to the future Gram Sevaks



thus from the very beginning the importance of extension as a method of Community Development, through which "a process of transformation of the social and economic life of the villages" was to be initiated, was fully recognised.

It was, however, obvious that this transformation could not be achieved all at once. India is a sub-continent. Large areas and a vast population are involved. Questions of finance and trained personnel had to be considered. It was, therefore, decided to phase out the new programme over two plan periods of five years each. Fifty five Pilot Projects were launched in the first instance.

Each Project area was designed to cover approximately 300 villages, with a total area of about 450 to 500 sq. miles, a cultivated area of about 1,50,000 acres and a population of about 2,00,000. The project area was further divided into three Development Blocks, each consisting of about 100 villages and a population of about 60,000 to 70,000. The Development Block, in turn, was divided into groups of 10 villages each, each group being the field of operation for a village level worker or the *Gram Sevak*. The aim was to concentrate the technical resources of the Government under unified control in these areas. An estimated expenditure of Rs. 65 lakhs, over a period of three years, was provided for each project area. The experience gained from the operation of these Pilot Projects was to be the basis for devising programmes for other areas in due course.

The entire programme was so phased that by the end of the First Five Year Plan (1955-56,) approximately one-fourth of rural India was covered by the National Extension Service and in another five years, i. e. by 1960-61, it is hoped that the entire country side will be similarly served.

The main elements in the Extension approach which is being adopted for the development of rural India are : firstly the method of Community Development; secondly, the agency provided by the Extension Service

Cultural activities at a Training Centre

for applying the method of Community Development in cooperation with the people; and thirdly, programmes of development, which give substance to the extension approach and bring official and non-official workers together in a common cause. Once the initial impulse has been given, a programme such as this grows out of its own experience and momentum. As it develops, it meets old needs and creates new ones. New methods are discovered, deficiencies long ignored come to be recognised, and in content and in the manner of its functioning the programme succeeds in solving some of the vital problems of the community.

The backbone of this whole programme is the village worker. As the strategic and vital link between the rest of the development programme organisation and the village people, he is the nucleus around which the whole extension programme is built. The task of training these village workers, which is vested in the Directorate of Extension and Training, Ministry of Food and Agriculture, is, therefore, an almost frightening responsibility but also a stimulating challenge. For how well *Gram Sevaks* succeed in their careers depends to a marked

extent upon the training which they have received.

The history of the training institutions working under the guidance of the Directorate of Extension and Training is well-known. It was in 1952 that five Extension Training Centres were established at Mandya (Mysore), Sindewahi (Bombay), Burdwan (W.B.), Bakshi-ka-Talab (U.P.) and Anand (Bombay). In October of that year, the Community Projects Programme envisaged the establishment of 1,200 blocks, which needed 12,000 trained extension workers at the village level, in addition to the various supervisory personnel at the Block Level. The Ministry of Food and Agriculture, entrusted to train these men, immediately took in hand the establishment of 29 more Extension Training Centres, in cooperation with the State Governments.

Today, there are 76 Extension Training Centres in the country and 62 Basic Agricultural Schools for pre-extension training, where carefully selected young men are undergoing an exacting programme of training for the service of the rural people in all spheres, viz., Agriculture, Health, Education, Rural Industries, Cooperation, Rural Organisations etc. The demand for the Second Five Year Plan is 33,040 *Gram Sevaks*.

In addition, a comprehensive programme of Home Science Extension Training has also been taken in hand and a number of Agricultural Workshops have been established to train village artisans.

The needs of the Group Level Workers posted at Block headquarters are looked after by the centres specially selected for them.

Extension training is a heavy responsibility. *Gram Sevak* trainees come to the training institutions with little technical training in the various subjects in which they must develop competence if they are to help villagers in understanding and dealing with their many problems. Even less is their knowledge of and experience with "Extension Methods", which must be adopted to stimulate villagers' interest and participation in development activities.

By and large, it can be said that the extension training institutions have made a promising start in imparting training in this new sphere.

The extension training institutions, scattered throughout the length and breadth of the country, are now passing from the experimental stage and becoming an inte-

The future *Gram Sevaks* learning to build a road

gral and accepted part of the Indian national life. Their contribution to the rural sector of the country's national economy has been of a high significance. The thousands of *Gram Sevaks*, whom they have trained, form a living proof of their achievements.

The extension training institutions may be settling into sustained work, but there is no complacent belief that their achievements and methods are adequate. There are newer heights to scale. Training methods have to be constantly improved to meet the increasing challenge of the expanding extension programme. Efforts are also now being made to integrate the basic training institutions with the extension training institutions and to establish firm integrated rural extension institutes as a permanent pattern, as well as the re-orientation of the original syllabus to a more job-oriented integrated syllabus. The equipment of the institutions with suitable text books has also been taken in hand.

Details of the various types of institutions working under the guidance of the Directorate of Extension and Training are as follows :—

1. Basic Agricultural Schools

There are at present 62 Basic Agricultural Schools and Wings functioning in the country. The twelve-month training course provided in these institutions is meant to give a thorough grounding in Agriculture and allied subjects to *Gram Sevak* trainees.

The subjects taught in these institutions, besides Agriculture, include Animal Husbandry, Dairying and Veterinary, Plant Protection, Climatology and Agricultural Engineering with adequate field practice.

Trainees admitted to these institutions are usually matriculates with village background. Their selection is made by a board consisting of the principals of the extension training institutions of the State concerned and certain other officials and non-officials. Selected candidates are further given endurance and aptitude tests at the training institutions before their selection is finalised.

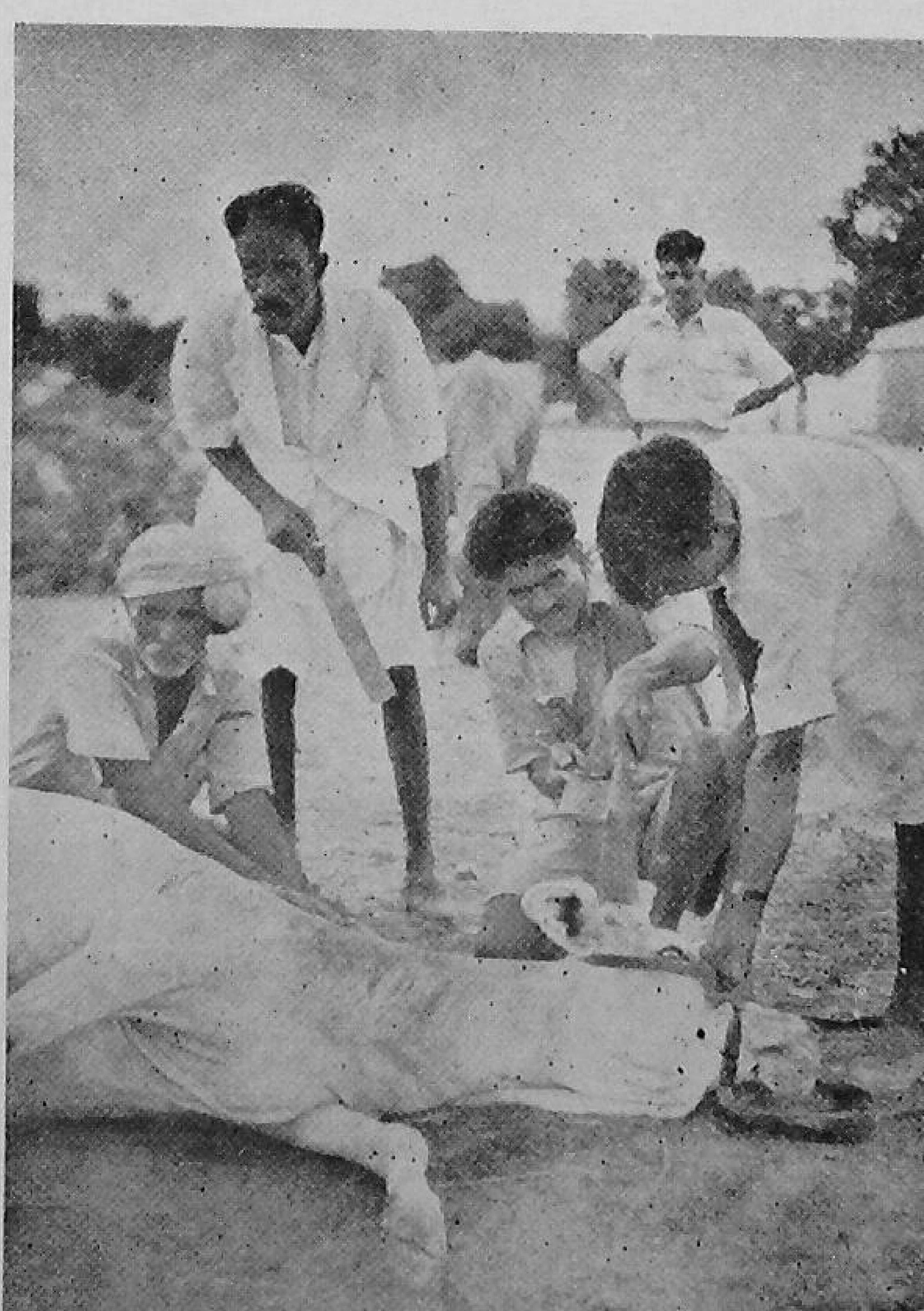
2. Extension Training Centres

After completing their training programme in Basic Agriculture, the trainees undergo a further six months' training in extension philosophy and methods and other subjects like Cooperation, Panchayats, Public Health, Social Education, Village Industries etc., in the Extension Training Centres. A short refresher course in Agriculture is also given at these Centres.

The trainees also make a detailed survey of at least one village and work as apprentice *Gram Sevaks* in the villages for three to four weeks before completing the course.

Since the beginning of the training programme, 13,439 persons have completed their training in the Basic Agricultural Schools and 26,050 have completed their training in

Gram Sevak trainees treating a bullock



the Extension Training Centres. At present 5,068 persons are undergoing training in the Basic Agricultural Schools and 7,528 in the Extension Training Centres.

3. Home Science Wings

Twenty-seven Home Science Wings are functioning at present in the country to train the women village level workers (*Gram Sevikas*).

Trainees admitted to these institutions are taught subjects, such as Food and Nutrition, Mother and Child Care, Housing and Management of Home, Handicrafts, Kitchen, Gardening, Extension Methods etc. Their training programme extends over a period of one year. *Gram Sevika* trainees camp out and work in villages to get acquainted with the village conditions.

At present 816 women have completed their training and 441 more are undergoing training in the different Home Science Wings.

4. Workshops

Nineteen Workshop Wings have been established to train village carpenters, blacksmiths and artisans in the repair and manufacture of improved agricultural implements and the construction of better village houses. The training course for the village artisans is of twelve months' duration. So far 308 artisans have completed the course and 194 more are undergoing training.

5. Group Level Workers

A two-month course to train Group Level Workers, or subject matter specialists in Veterinary, Agriculture and Cooperation attached to the various Development Blocks, in Extension Principles and Methods is being conducted at eighteen Extension Training Centres. Training is given to the subject matter specialists in Extension Principles, the technique of supervision and guidance of the lower field workers, widening villagers' horizon and securing their active participation, as well as in Agriculture, Cooperation, Animal Husbandry, Rural Recreation etc. So far, 3,336 subject matter specialists have completed their training and 139 more are undergoing training.

6. College Extension Wings

Besides these institutions, five Extension Wings have been functioning at the different Colleges of Agriculture under the guidance of the Directorate of Extension and Training.

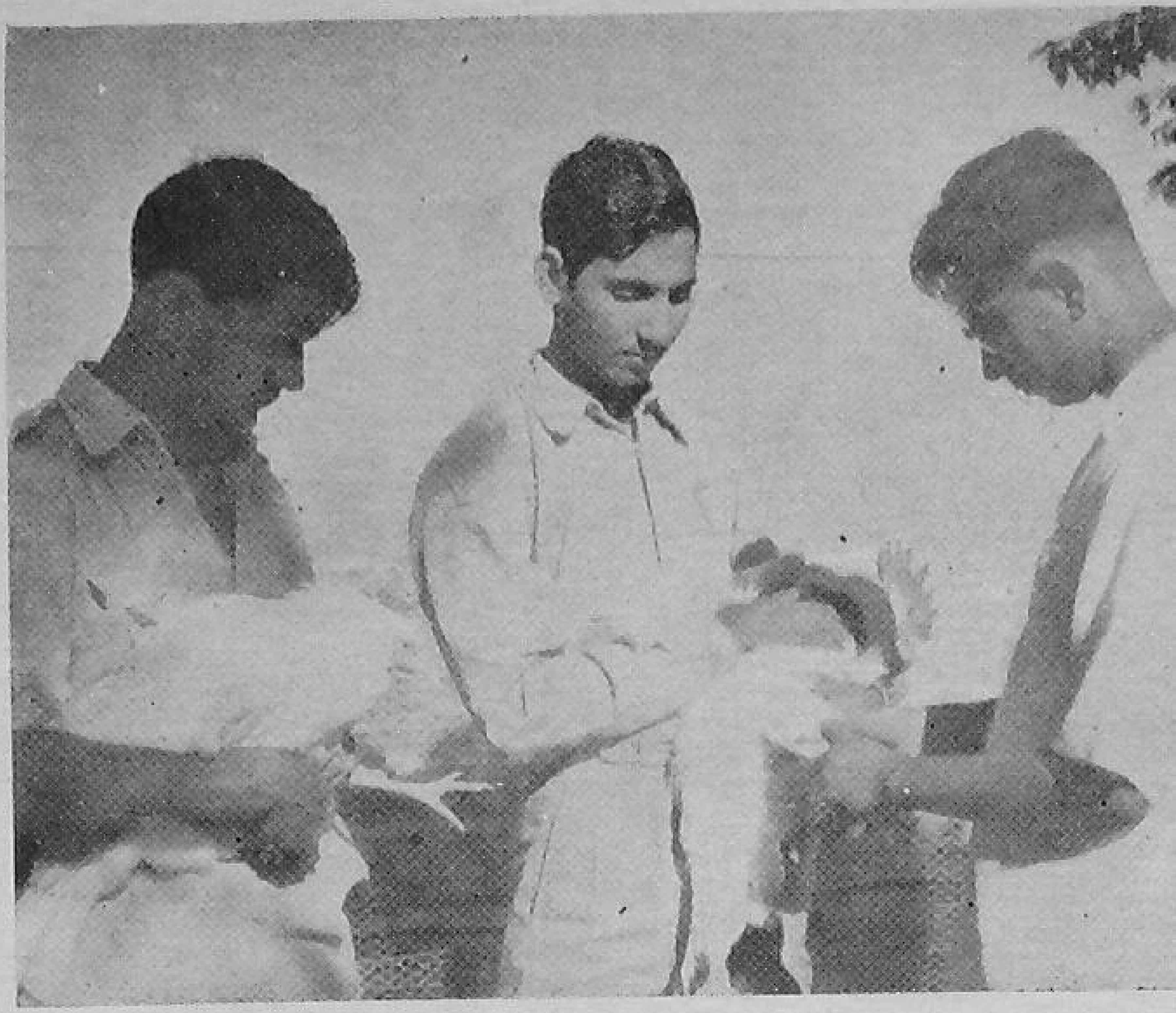
These Extension Wings provide facilities for practical and theoretical training in Extension Principles and Methods to students of agriculture, along with other subjects taught in the colleges.

Recreation is an important part of extension training

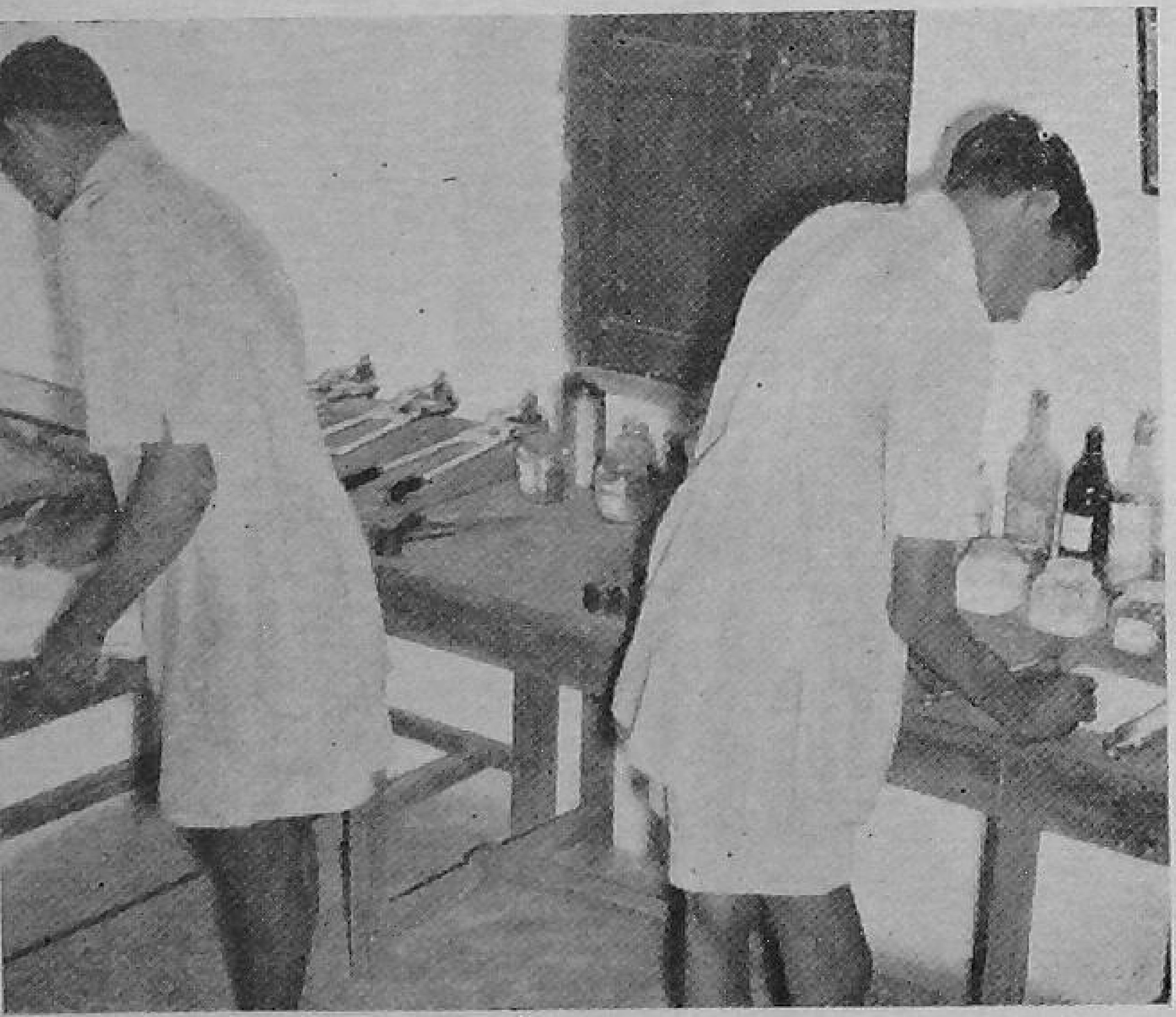
The requirements for trained extension personnel of all kinds for bringing the whole country under the extension programme are indeed very large. An idea of these can be gathered from the following table :—

Sl. No.	Category of workers	Total requirements	Nos. already trained until 31-1-58	Institutions where trained	No. of Training Institutions as on 31-1-58
1.	Village Level Workers (Men)	50,000	13,013	Basic Agri. Schools	78
			24,023	Extension Training Centres	68
2.	Village Level Workers (Women)	3,520	716	Home Science Wings	27
3.	Block Development Officers	5,000	1,811	B. D. O. Training Centres	4
4.	Extension Officers (Agri. & Animal Husbandry)	10,000	3,307	G. L. W. Training Centres	18
5.	Social Education Organizers	10,000	3,263	S. E. O. Training Centres	13
6.	Extension Officers (Cooperation)	5,000	810	Coop. Officers Training Centres	8
7.	Extension Officers (Industries)	5,000	1,151	Small Industries Service Institutes and Khadi Gramodyoga Mahavidyalayas	11
8.	Extension Officers (Health)	5,000	1,302	Health Officers' Training Centres	3

The stage has not perhaps yet been reached when a final assessment can be made of the whole extension training programme. Nevertheless, it must be recognised that extension training has come to stay for good in the country. Even after the physical requirements of trained personnel have been met, the training institutions will have to be retained for a number of tasks such as the replacement of personnel, the meeting of additional demands for personnel in terms of further intensification of the development programmes, refresher training for staff in the field, training of farm youth, village leaders and village school teachers etc. Further the whole content and manner of extension training will have to be constantly kept under review. Already the integrated institutions, which are envisaged, are bound to increase the usefulness of the extension training programme and the central institutions, which are being planned in addition to those being run by the States, are likely to provide a more vigorous leadership than has been available hitherto in this field. The other element which needs greater attention is the training of the instructors in the training institutions. For it must be recognised that the extension training programme can be only as effecient as the quality of the trainers available. The growing recognition of the importance of extension training by higher educational institutions in the fields of Agriculure, Animal Husbandry, Veterinary Services and Agricultural Engineering also augurs well for the future of the extension training programme in the country.



Trainees learning the principles of good poultry management

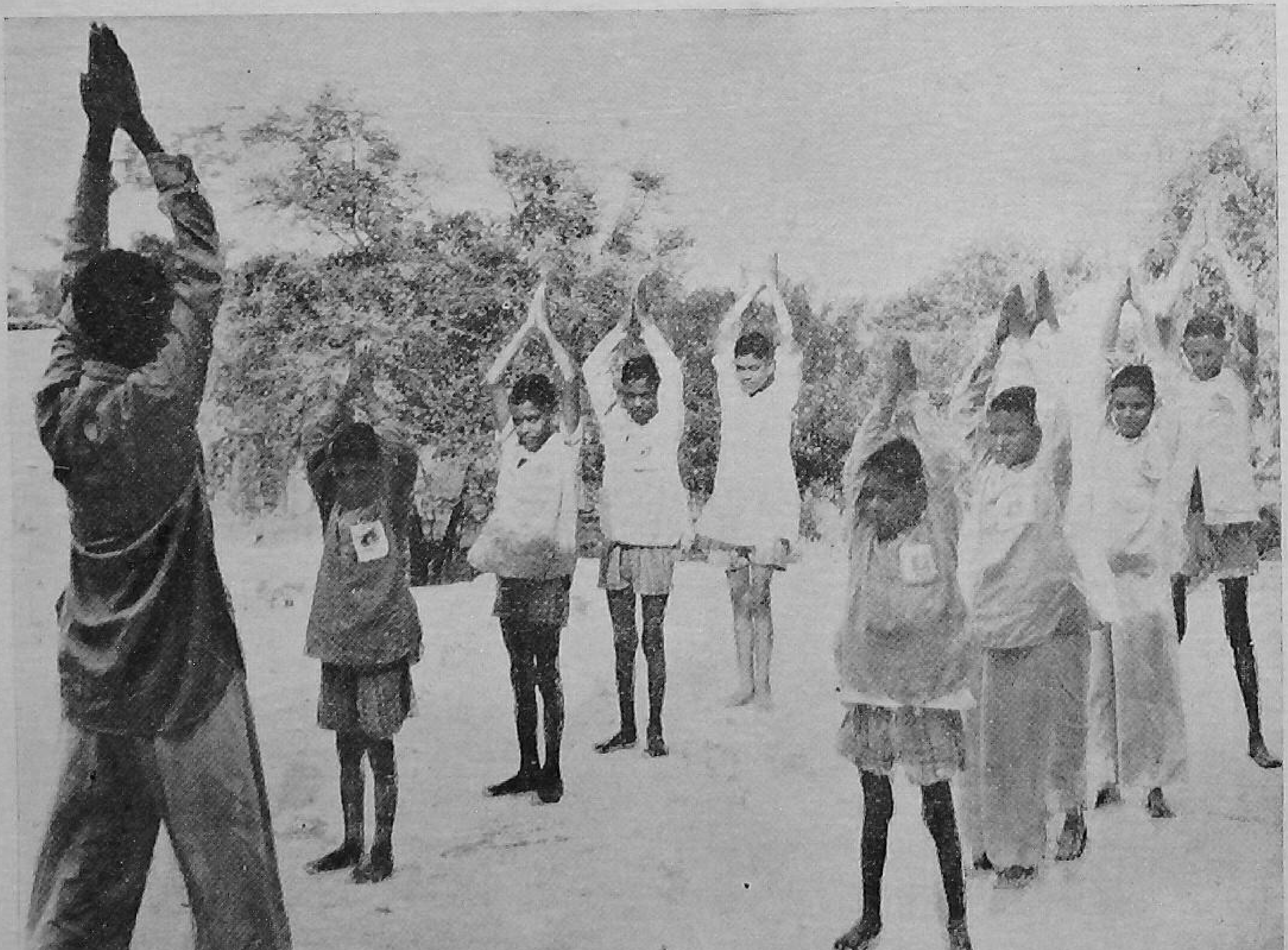


Trainees in a veterinary laboratory

of songs and folk songs for the youth was compiled. A 2,000 feet documentary, namely, 'Yuvak Mangal Dal' was prepared and has been acclaimed as one of the best productions on the subject. This has been exhibited all over the country. A number of slides having bearing on the various projects and youth activities have also been prepared. The publication of the newsletter 'Nav Yuvak' has fulfilled a long felt need of the rural young men and is serving as a forum for youth activities. Originally started as a free monthly publication it has now been made a priced fortnightly newsletter and is being subscribed by a little over 3,000 young men and women.

Three years have passed since the experiment was started. The organisation originally restricted to two small experimental labarotories has spread over the whole of the state by now. The total number of clubs today stands at 1,152 and the membership has gone beyond 20,000. The Institute wished it could achieve something more, but the cautious, rather too cautious, steps retarded the speed of expansion. Another difficulty was the lack of voluntary leaders. Ultimately the entire programme has to be shouldered by the voluntary village leaders and their dearth at the moment may caution us to wait for some time more untill we can completely rely on the voluntary agency for the execution for the programme.

Youth club members preparing for a special programme



ACHIEVEMENTS

Facing all these odds and working in the midst of trials and difficulties, the following perceptible results have been noticed :—

(1) Community mindedness

(a) Generations old enmity among rural youth is steadily disappearing and nearly all the youths of the villages where clubs have sprung up are keeping and working together.

(b) Members are learning simple lessons in democracy by electing their office bearers, moving a resolution, seconding it, voting for it, etc.

(c) Social barriers are being broken. The rich and the poor and the high and the low all sit together and participate in the club activities.

(2) Extension work

The youths are learning improved pratices relating to agriculture and animal husbandry, crafts and public health, and are also, directly or indirectly, disseminating these among their parents, guardians and neighbours.

(3) Physical, cultural and recreational activities

Young farmers are celebrating festivals and national days in a befitting manner. They have become health minded, have acquired confidence in public speaking, reciting and acting.

With all these, we hope for a general rise in the level of living. We also expect that the role of such organised rural youngmen would be of no small order in our programme of national reconstruction.

A youth club member with his excellent turmeric crop

Agricultural Education in India

SYLLABUS

VERSUS

CURRICULA

— *Geo A. Filinger*

Most agricultural colleges in India use a rather rigid syllabus and all students, regardless of interest, sex or natural talent must take the prescribed courses offered. Agricultural colleges in the United States, in contrast, use so called curricula or lists of course offerings for special groups of students. Students in the U.S.A. have a rather wide latitude in the choice of courses depending upon their "major" interests and on the requirements of the use to which the training will be put. Before entering into a discussion on the merits of these two systems it might be well to define Agriculture and Teaching and list some objectives of Agricultural Education.

Agriculture is :

1. An Art. That is, the villager or farmer must do or perform certain tasks connected with production, harvesting and disposal of his produce.
2. A Science. Agriculture is based on many sciences such as chemistry, physics, botany, zoology, pathology, entomology etc. In other words Agriculture is the application of many sciences.
3. A Way of Life. A form of human experience. The farmer and his family live in the midst of their vocation. Agriculture is more of a family affair than most other enterprises.

4. A Vocation. A means of earning a livelihood. (In a few cases farming may be an avocation or a sort of hobby or sideline).

All these definitions should be considered in connection with a discussion of modern Agricultural Education.

Teaching is :

Guiding or directing students as they learn, that is, as they attain knowledge and skills which influence their attitudes and behaviour.

Objectives of training in Agriculture may be conveniently divided into two parts in view of the definitions of Agriculture given above.

1. **Teaching Agriculture**

(*a*) Impart to students a body of knowledge of agriculture which they can use when through college.

(*b*) Develop skills or manipulative abilities which will be useful in later life. It affords an opportunity for students to "try their hands' at doing farm work.

(*c*) Prepare and inspire students for a vocation.

2. **Teaching Students**

(*a*) Make better citizens by developing correct attitudes towards their country and their fellowmen, by helping form good habits and manners and by creating self respect.

(*b*) Improve means of communication, both oral and written.

(*a*) Develop ability to 'think', that is, apply knowledge in solving problems.

(*d*) Develop creative abilities—the creation of new wealth by applying human effort to natural resources.

Students levelling a road

Practical training in bee keeping at an Extension Training Centre

(*e*) Improve abilities to earn a respectable living for the students and their dependents.

Educationists who accept this broad definition of Agriculture and those objectives in Agricultural Education, agree that teaching agriculture to both rural and urban students is not easy. Which of the two systems, Syllabus or Curricula more nearly fulfils the objectives listed ?

1. **Impart to students a body of useful agricultural knowledge**

Both systems tend to impart agricultural knowledge. Someone has said that the Syllabus system tends to teach "less and less about more and more, whereas the Curriculum system teaches more and more about less and less". In other words, under the Syllabus, students become "Jacks of all trades" whereas under the Curriculum students become "masters of a few trades". It would seem that it would be more useful to have thorough training in one major phase of agriculture than a smattering information concerning the whole field of agriculture.

2. **Develop skills in agricultural work**

It is practically impossible for students to become skilful in all the various agricultural procedures because of the limited time while in college and, because few have the necessary talents or the required patience. Rarely would the same student become an expert in floral arrangements and also a master at shoeing a bullock.

3. **Prepare for a vocation**

If Indian agriculture is to develop, as it

must, more trained men will need to take up farming as their vocation. At present only about one percent of the agricultural graduates become farmers. More students should be trained for farming rather than away from farming. A manager of a tea garden in Darjeeling requires a different type of training than a paddy farmer in Andhra. It would seem that a student under the Curriculum system, who specializes in one phase of agriculture, would be better prepared for an agricultural vocation than one studying general agriculture under the Syllabus system.

4. **Making better citizens**

This certainly is a laudable objective. Any training that would not result in better citizenship would be short-sighted. Sri Bhimsen Sachar, Governor of Andhra Pradesh, said in a recent All India Radio broadcast ;

> "I need hardly remind you that economic advancement alone does not make for full nationhood; we have to concentrate also on the multiplication of a better class of citizens characterised by the spirit of service, love, sympathy, fellow-feeling, sacrifice, tolerance, generosity and a strict sense of discipline. The country badly stands in need of men and women of a very high moral calibre who are prepared to dedicate their all to the service of the Motherland and Humanity".

The Syllabus which endeavours to cover the whole gamut of agriculture does not allow time for such courses as history, psychology, sociology and citizenship. All well-planned curricula do provide the above courses. Since 70 to 80 percent of the people of India depend directly or indirectly on agriculture it would seem logical that training in citizenship should occupy an important place in agricultural training. India needs more consecrated agricultural leadership.

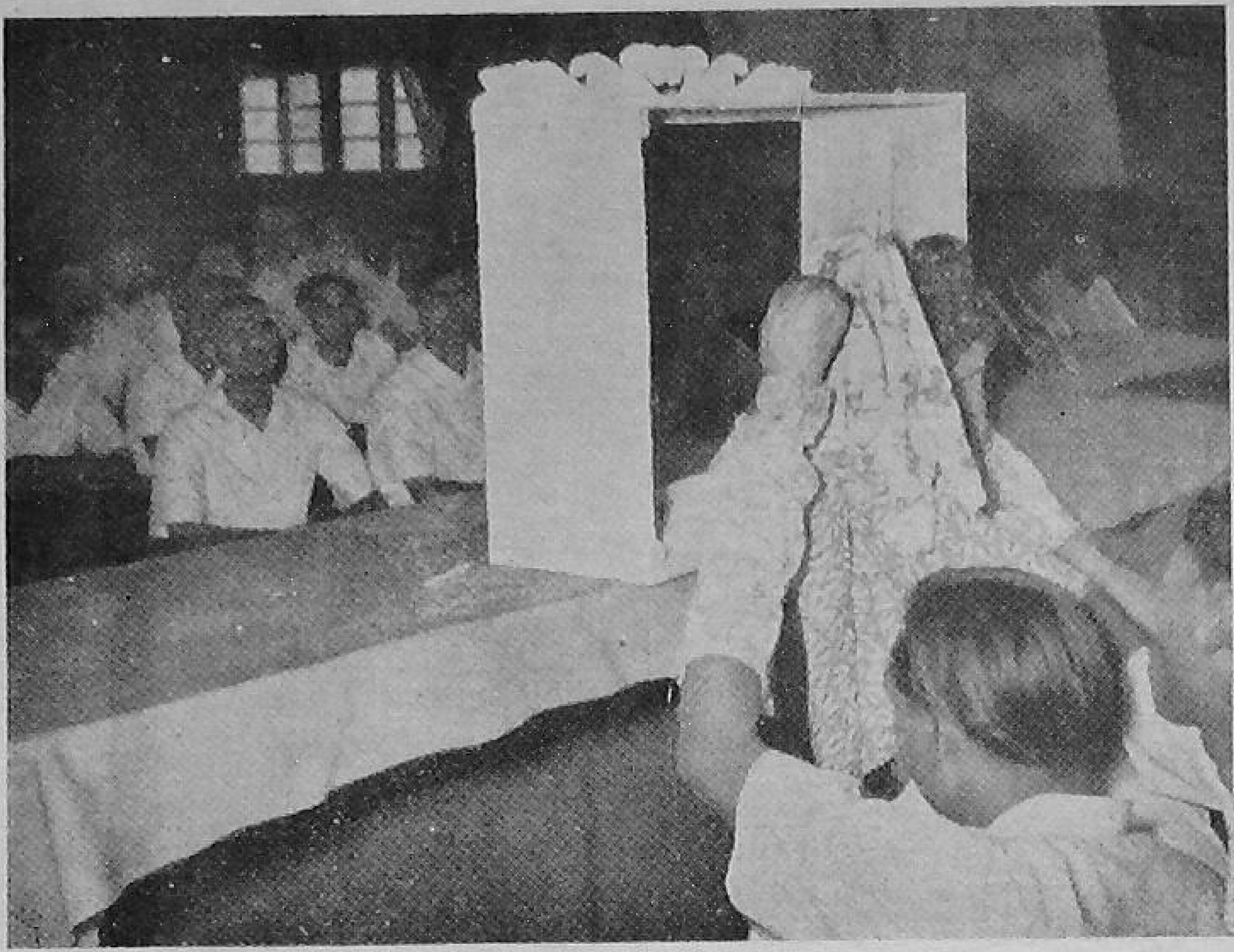
5. **Improve means of communication**

Both systems tend to improve written communication because of the many "papers" required in the Syllabus and the frequent examinations in the Curricula. There are several formal courses in written and oral communication required in all agricultural curricula. There is very little time left for these courses in the Syllabus.

6. **Develop abilities to "think"**

Good teaching requires students to think or reason. Under the Syllabus system the teacher is so busy imparting "facts" which the students will need to pass the external examinations, that there is insufficient time left to present "problems" for students to attempt to solve. Professor M. S. Doraiswamy, Vice Chancellor of the Osmania University, recently wrote :

Visits to agricultural museums have great educational value



A puppet show in progress at an Extension Training Centre

"It may also be charged against our Universities that while they have disseminated knowledge, they have not equally encouraged original and independent thinking and that the quality of research produced in our universities is still very low. It is perhaps also true that we have sacrificed wisdom in the pursuit of knowledge and that in our Universities, created on the model of Western Universities, we have tended to give only a subordinate place to our own history, culture and tradition".

The Curriculum System covers a single hase of agriculture thoroughly enough, so at a student has enough knowledge of the subject" to exercise reflective thinking and lving problems.

. **Develop creative abilities**

The wealth of any nation consists of its atural resources and human effort. Farmers nd agricultural workers have many oppor-unities to create wealth. The Syllabus Sys-em in its attempt to cover the whole field of griculture cannot train students to do crea-ve work in all phases of agriculture. Stu-ents who specialize in one phase of agricul-ure under the Curriculum System can obtain sufficient training to enable them to do creative thinking and creative work.

8. **Improvement of abilities to earn livelihood**

Agriculture is a specialized business. The most successful farmer is one who produces, economically, more goods than he needs for his own use and has some to exchange for other necessities of life. A person trained under the Curriculum System would seem best prepared to earn a respectable living because he would be well versed in a single phase of agriculture. He should also find the greatest satisfaction in his work, because he would be doing that in which he has the greatest interest. Training of satisfied and happy agriculturists should not be overlooked in any consideration of agricultural education.

Arguments given by an Agricultural College Principal in favour of the Syllabus System are :

1. It maintains high scholastic standards.
2. It assures a thorough coverage of the field of agriculture.
3. It gives agricultural teachers, who conduct external examinations, addi-

tional income to augment their meagre salaries.

Their first argument seems valid in the absence of some voluntary accreditation. It should not be difficult to find some agency which could prepare standards and establish safeguards so that even higher scholastic ratings could be achieved.

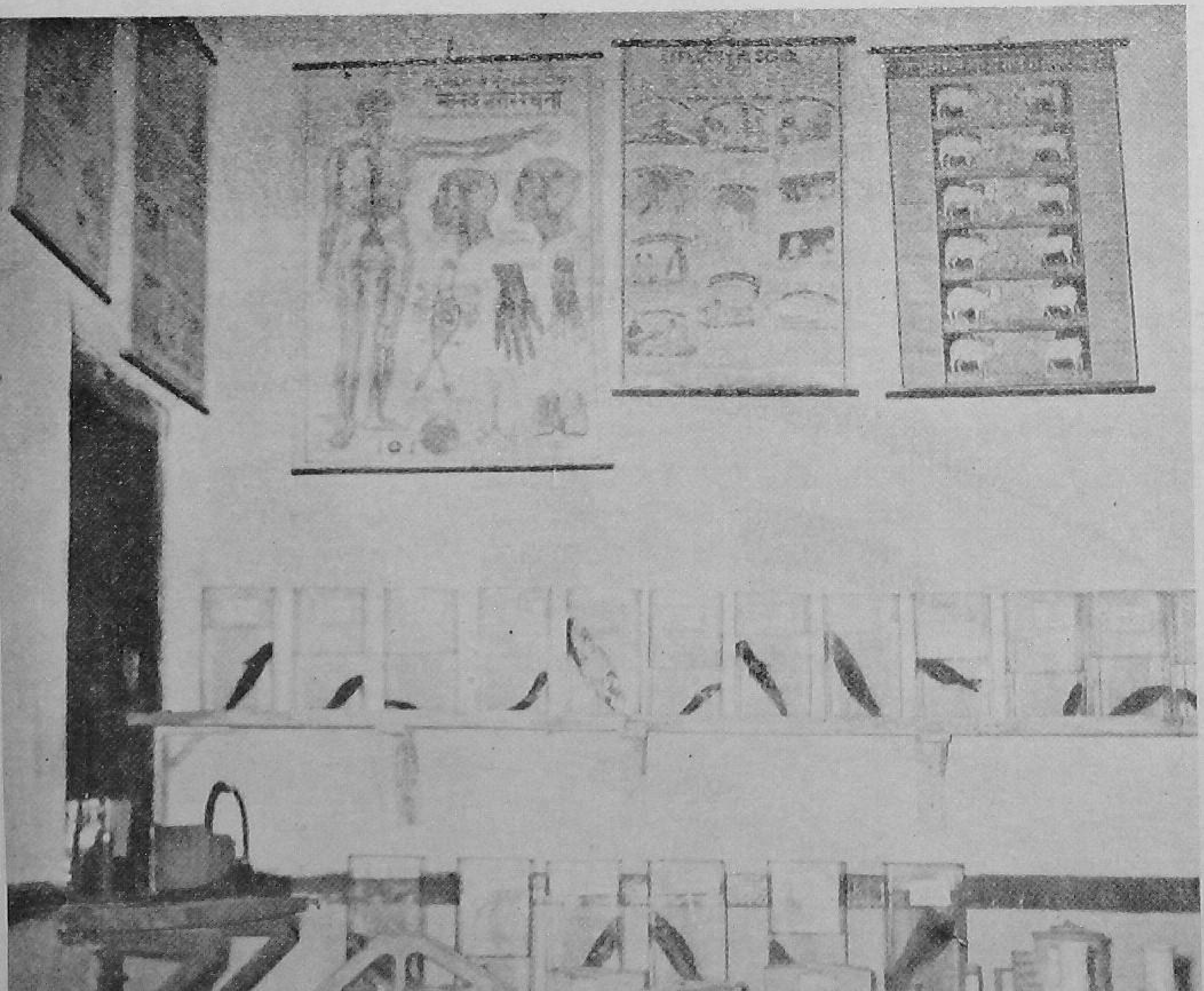
Argument number two was discussed under objective number one above.

As for the third argument, all are agreed that college lecturers and professors should have additional income, but the money now spent on external examiners can be more efficiently used to raise salaries on a merit basis rather than under the guise of an honorarium for conducting external examinations.

External examinations not only bring in much needed additional income but afford opportunities for the examiners to visit other institutions. Such exchange of visits should be encouraged, but should not stand in the way of progress in educational methods. Agricultural workers and teachers could meet occasionally in groups of similar interests, such as in Regional or National Associations of Agronomists, Horticulturists, Animal Scientists, Principals, etc.

The writer will welcome any suggestions or criticism concerning these two educational systems. It seems to him that the syllabus system is important impediment in the progress of agricultural education in India. However, he suggests that changes should be gradual.

The writer is suspicious of the third argument as being the most important one when a change in the system is suggested.



Visual aids are very effective in agricultural teaching

PROBLEM OF INDIA'S FOOD PRODUCTION

— L. E. CARD

A casual visitor might easily conclude that solving India's pressing problem of food production is really very simple. All that is necessary is to combine the many small holdings into farms of larger size, introduce mechanical methods of tillage, bring under cultivation the thousands of acres now lying idle in some sections, reclaim the extensive areas of alkali land, apply commercial fertilizers, and make more effective use of available irrigation water. These things would in fact make possible a phenomenal increase in food production, but such an off-hand pronouncement would ignore completely some of the inherent difficulties. Even if the necessary capital were made immediately available, there is the long-standing system of land tenure to be considered, and the socio-educational problem of changing the practices and the thinking of several million cultivators. To point out some of the difficulties, I should like to quote, with a few slight changes in wording, from the concluding section of a paper by Dr. S. R. Sen, entitled "The Problem of Population and Agricultural Productivity in India". Dr. Sen says:—

"India suffers from certain handicaps in view of the fact that she started rather late in the field of economic development and has a massive population to provide for. Unlike 19th century England she will not be able to send out her surplus population to foreign countries. Unlike Japan she will not be able to find adequate markets abroad for the very large industrial output which will be necessary for providing employment to, and improving the standard of living of her massive increasing population. It is therefore essential that she should plan for a co-ordinated and parallel development of large scale basic industries, small scale agro-industries, and agriculture, so that each sector may generate adequate power which will help absorb the increasing production of the other sectors.

"In India the problem is not merely one of finding employment for her population and of producing more. It is also important that she should herself be able to absorb most of her own production, agricultural as well as industrial. There is already a pressing problem of surplus agricultural labour in

India. It is estimated that even on the basis of the existing antiquated technique of agriculture, there are about 15 to 20 million surplus workers amongst people engaged in agriculture. If there is mechanisation of the technique of cultivation, there is likely to be a sharp increase in this number. This problem has, therefore, a very important bearing on the question of what techniques of farming India can adpot without creating serious dislocation of her economy. Unlike most of the Western countries, India has a scarcity of both land and capital, it is only labour which is in plentiful supply. Therefore the systems of farming and techniques of cultivation which have evolved in other countries will not necessarily suit India's requirements. India will have to develop her own systems and techniques which will have to be of the land and capital saving type, at least for some time to come, and her optimum farms will naturally be of much smaller size, much less mechanised, and possibly much more diversified than in many other countries".

Whether or not one agrees entirely with Dr. Sen, it is clear that the theory of economic growth calls for a somewhat different interpretation in a land where there is a superabundance of labour than in countries where there is need for making every hour of labour as productive as possible.

After more extended observation and study, the casual visitor mentioned in the opening sentence is more likely to marvel at the significant changes which have been accomplished in the past ten years than to be highly critical of conditions as they exist today. Progress in India may be slow by present Western standards, but if it is steady and continuous as indicated by the recent past, the ultimate achievements will be a just cause for pride on the part of all Indian people.

Even small improvements like the use of improved ploughs can help a lot in increasing agricultural production

PATTAMBI TRAINEES HAVE GREAT SUCCESS IN VILLAGE PRACTICALS

— EARL I. BACON

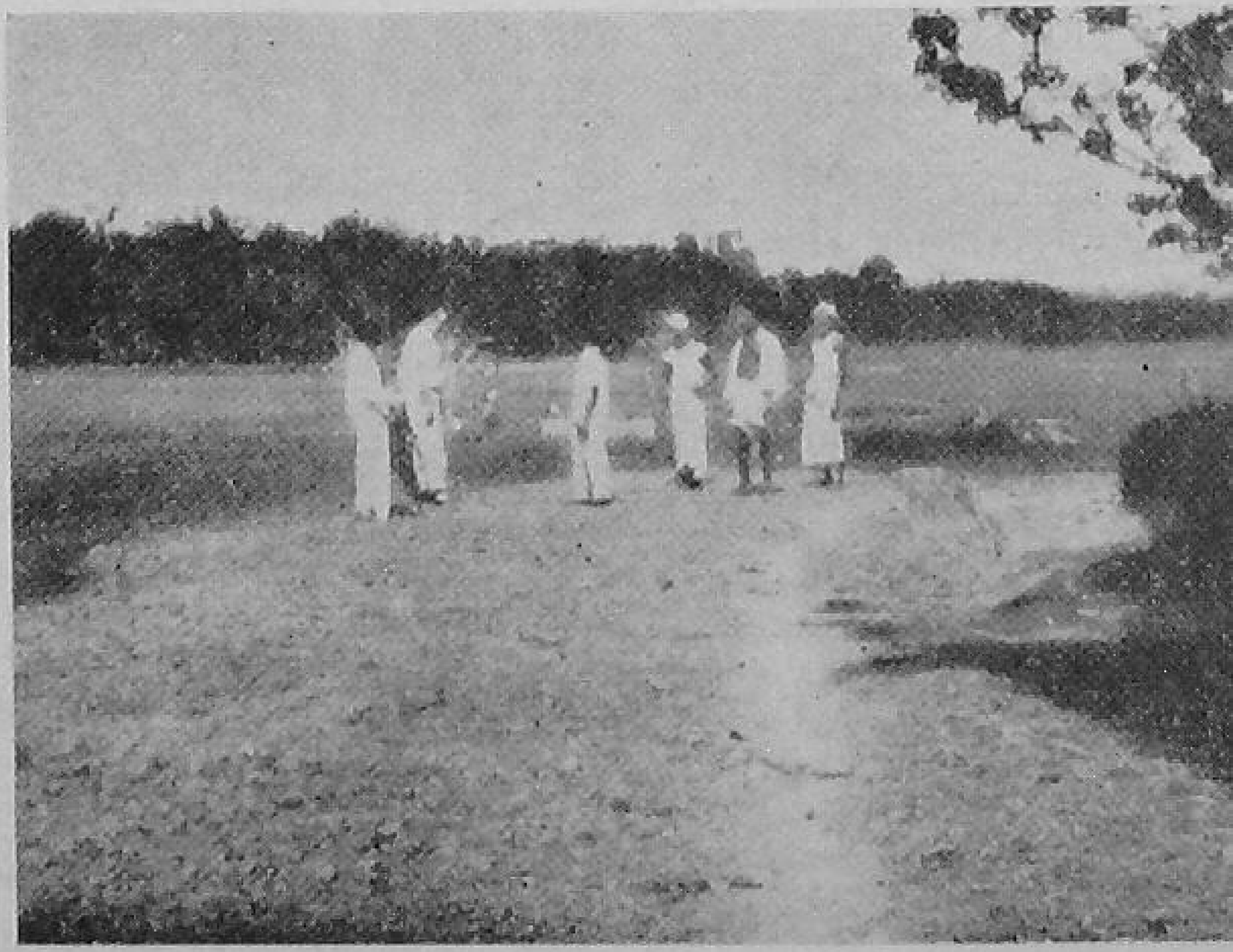
The Pattambi Extension Training Centre completed four weeks' training in village practicals on December 6, 1957, in the village of Chembra, South Malabar. Thirty nine trainees of the Centre selected and made all the arrangements for camping at the village in order to receive experience in the art of extension as they had received instruction in theory.

The village of Chembra is located two miles away from any road or highway. The only approach to the village is by walking the bundies of the paddy fields. Many of the villagers had never seen an electric bulb, heard a radio, seen a cinema or even a loud speaker.

The villagers, 40 years ago (1917) started discussions on building a road so that the people could market their produce. Because of the lack of leadership and the spirit of cooperation the idea of an outlet to the outside world only remained an idea. Many times the villagers discussed the idea but were always defeated by one cause or the other. A high caste villager, Shri Namboodiri, even put up pillars across a ravine, of rock and cement at his own cost a few years ago, but the *Panchayat* could not complete the bridge because there was no road. Perhaps if he could have completed the bridge the incentive would have been furnished for the villagers to build the road but again the idea was laid aside to wait for the coming of the trainees. Today the whole village is turning out with all the hand-tools that could be found to build a road to the outside—something that has been a dream to every villager for 40 years. These four miles will take sweat, tears and time, but all stated they were willing to sacrifice now for the future.

Today and in the past all produce was carried by head-loads, two miles away, to a river. At the river they put their precious

A completed portion of the road



Bundies to Chembra village will soon be replaced with a road

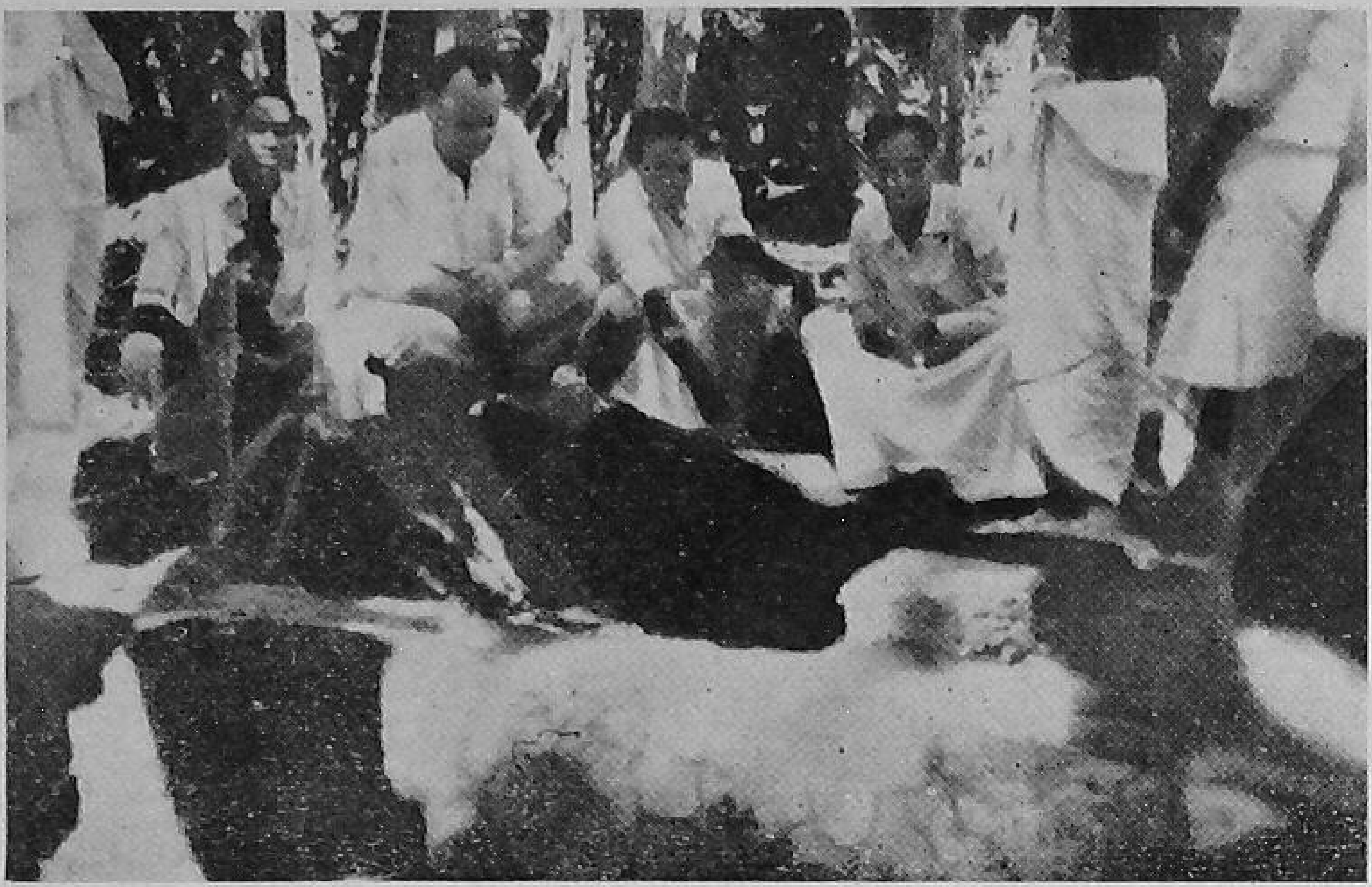
cargo in small boats or barges to float down the river to a place where other means of transportation deliver the produce to their destination. Even this has had its handicaps, for about four months of the year the area is flooded by the overflow of the river. During this interval, the villagers turn to cottage industry, gathering of herbs, etc. for their livelihood.

Village Cooperation

Many of the trainees were doubtful of the villagers for no one had ever worked with or for these people. No agricultural improvements existed. Latrines were unheard. Manuring was all done in the form of green manures. The trainees brought many new names to the villagers in the form of the Japanese Method of Growing Paddy, insecticides, compost pits, latrines, etc. The trainees in return learnt many things from the villagers like medicines made from different herbs, roots etc. They even killed a python and the villagers made medicine for them from the fat.

The measure of village cooperation can be judged from the following accomplishments by the trainees for a period of work of only four weeks :—

Individual visits	300
Compost pits built ..	130
Manure pits built	86
Soak pits built	42
Kitchen Composts built ...	4
Trench Latrines made ..	16
Slab Latrines built	1
Urine pits built	8
*Japanese method of Paddy cultivation	60 cents
Bulls castrated	50
Animals treated for diseases, insects and parasites ...	40
Improved tapioca cultivation	2 acres
Kitchen gardens	9
Bee-hives constructed & coloniated	2



An improved soak-pit

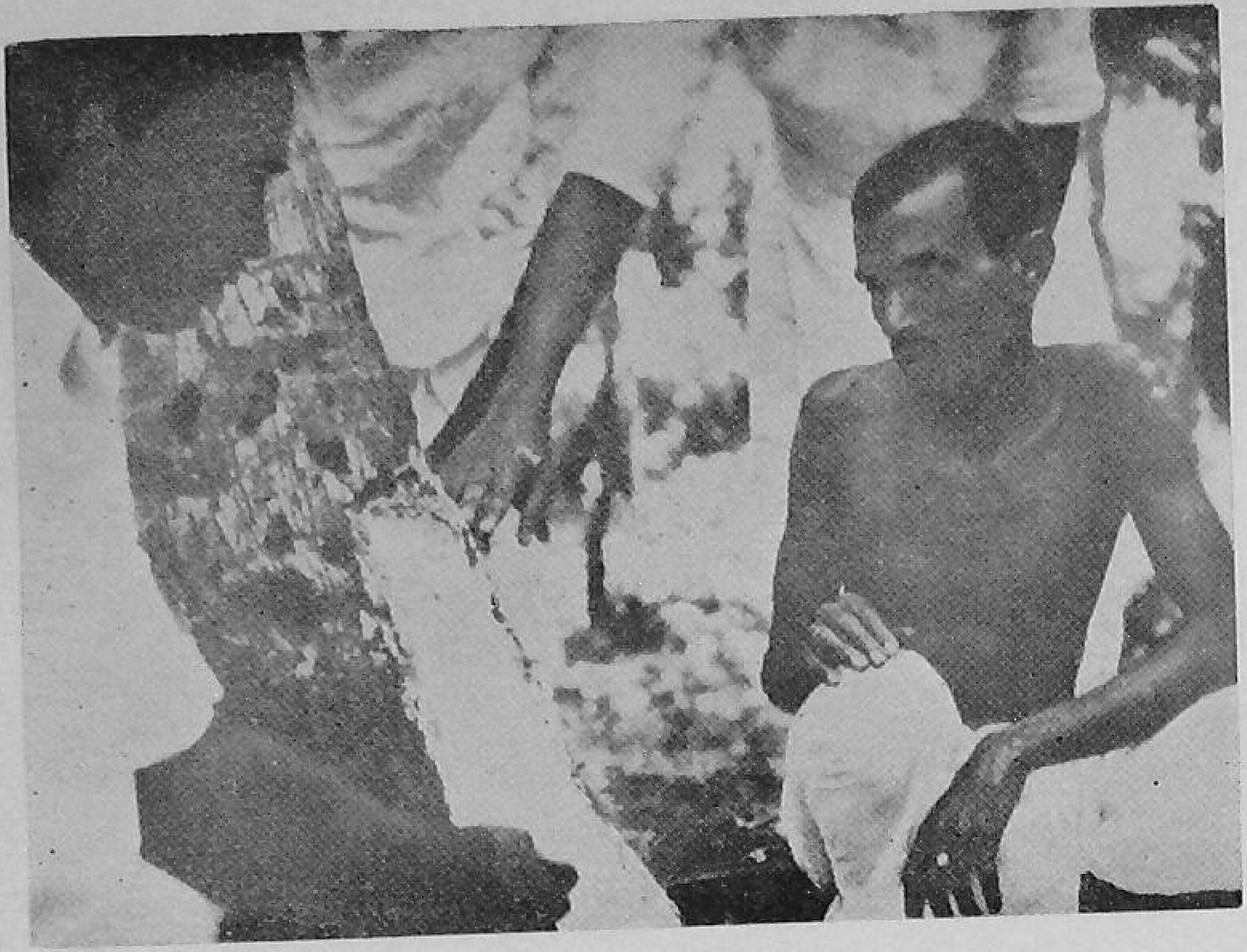
Cleaning of Wells	.. ..	4
Silage pits	... .	1
Treating of Cocoanut trees for pests	.. ..	61
Cocoanuts planted	... ..	78
*Ammonia Sulphate applied	...	400poudns
*Paddy mixture applied	..	200 ,,
*Benzine Hectichloride (BHC) used	... ..	100 ,,
*Folidol used	.. ..	2 tubes
Entertainment for Community (by trainees and villagers)		16
Film Shows	.. ..	8
Group Discussions for all the area	... .	10
Road Construction started	..	4 miles
Local public meetings attended by trainees	.. ...	8
Institutions visited by trainees	.. ..	1
Small group discussion meetings conducted by trainees	...	154

**Trainees were too late to accomplish more due to season of growth etc.*

Production is increased by the Japanese Method of Paddy Cultivation

A trench latrine

Villagers and trainees at work, building road



A cocoanut tree being treated for pests

The trainees believe their greatest amount of good came from holding small group discussions, meetings with the farmers in solving their (the farmers') problems.

The trainees were divided in groups of two. One group had three members. Each group selected an outstanding farmer in his area as their adviser and link between them and the rural people. The trainees held many conferences with "their cultivator", as he was called, on problems, meetings, subjects to discuss with the villagers, etc.

As the instructors spoke to the trainees all faces became bright with enthusiasm and conviction that a new day can be made for the villagers through proper extension methods. The villagers are confident that a new way of life is opening for those that desire. One villager praised the efforts of the trainees in these terms: 'We are proud that some one cares for us'.

An improved manure pit

BHAVANISAGAR TRAINING CENTRE

— K. SANTHANAM

Bhavanisagar is a growing township in the midst of a typically rural area. This township is free from urban turmoil but at the same time, amenities like water supply, electricity and accomodation are available.

A fish farm and an Agricultural Research Station are located here. Many villages, yet underdeveloped, are scattered around it. Naturally this place was found to be an ideal one for establishing an Extension Training Centre. A Basic Agricultural School was started here in July 1954 with a fifty-acre farm attached to it and in February 1955 an Extension Training Centre was also inaugurated.

The aim of the Training Centre is to make the trainees learn the new things through self experience and practice. Instructors at the Centre see that the trainees are not denied self-expression as far as possible. The mind and character of the trainee is moulded here along with full and free development of individuality. We have introduced new methods, to keep the trainees busy throughout the day, like working with brick and sand, kitchen gardening, painting, poster display and cultural programmes. Indeed it is through such activities that the moral lessons of piety, honesty, generosity, fellow feeling, subordination to the group, cheerfulness in defeat and the like are learnt.

The daily routine, curriculum, and work plan of this Training Centre provide ample opportunities to the trainees for development of self-initiative, self-effort, self-activity and self-reliance. Inventiveness and adaptability are encouraged among them.

Trainees learning the management of sheep

Trainees purchasing hanks from villagers

The day begins for the trainees with the morning bell at 5 A. M. and ends with the lights off at 9.30 P.M. One full hour from 7.15 A.M. is devoted to audio visual education and cultural classes. The rest of the morning is devoted to extension work in the villages. Theory classes are conducted in the afternoons. All the trainees regularly attend prayers in the mornings and afternoons. An hour in the evening is reserved for supervised study.

The curriculum includes extension and rural uplift, agriculture, animal husbandry, education including social education, co-operation and village *panchayats* and cottage industries.

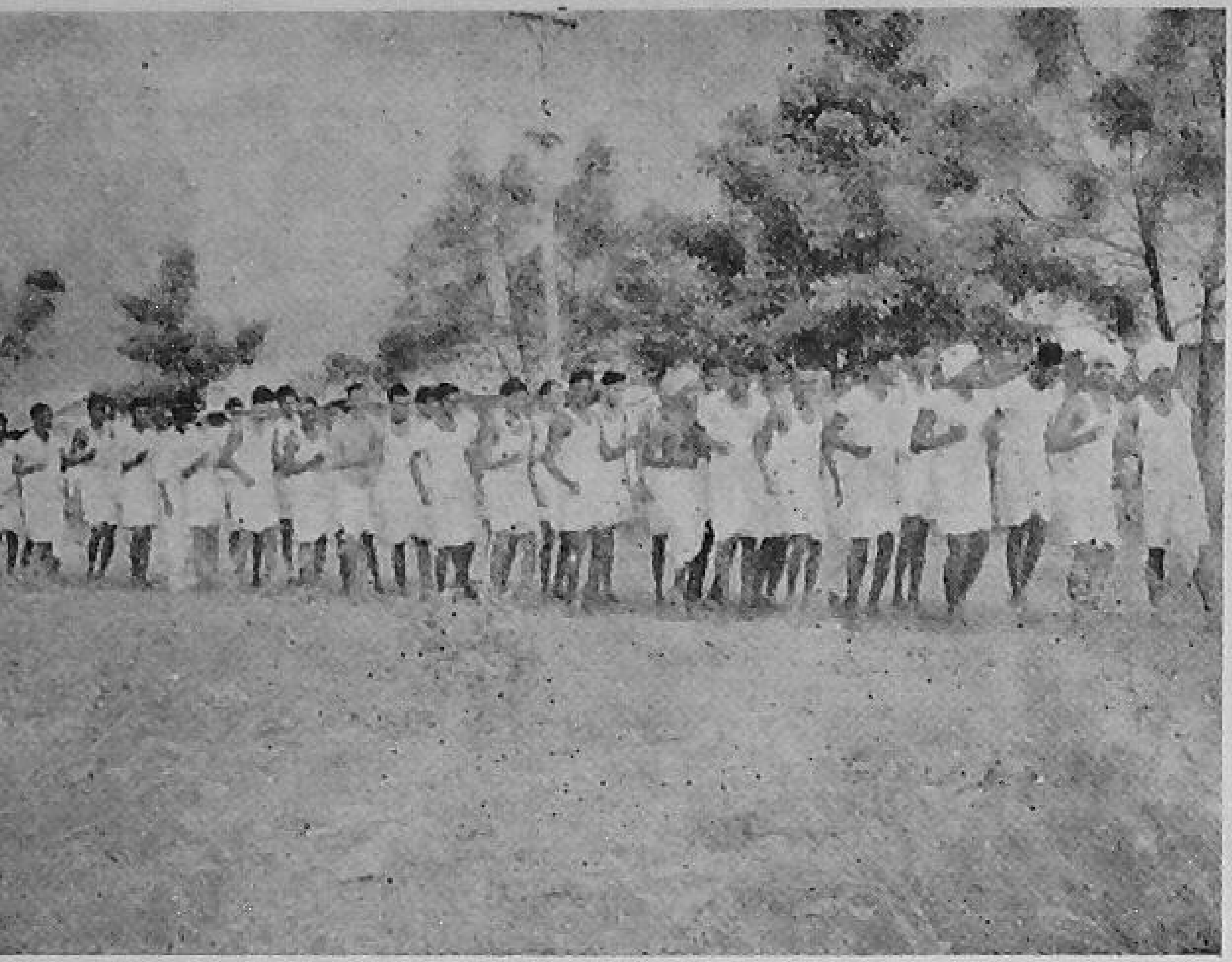
Theoretical instruction is corelated to practical work in the villages. In addition to regular lectures special lectures on topics like rural economics, constructive programme of Gandhiji, nutrition, plant protection, pisiculture, beekeeping etc. are also given.

Authoritative approach to the villagers is completely ineffective in the present democratic set up. The role of a *Gram Sevak* is that of a partner guiding and counselling the villagers in their day to day tasks. He should not go with a fault finding attitude, decrying what ever work is being done. So he has to sit with the villagers, understand their difficulties and suggest ways and means of overcoming them.

These principles are taught to the trainees, and they actually experience their usefulness in the village work. The trainees conduct a survey of social and physical environment of the villages. The trainees are engaged in this survey work for about two weeks. Problems like outbreak of diseases, drying up of wells etc. are carefully studied by them and information is brought to the Centre. This data is carefully sorted out and discussed. On the basis of this, a plan of work for the trainees is formulated.

Each instructor of the Training Centre is incharge of a group of trainees and guides them in their village work. The day to day work plans for each village are evolved after group discussions. The local

Shramdan activities
A road being built with the cooperation of the villagers



Trainees taking exercise to keep fit for the day's work

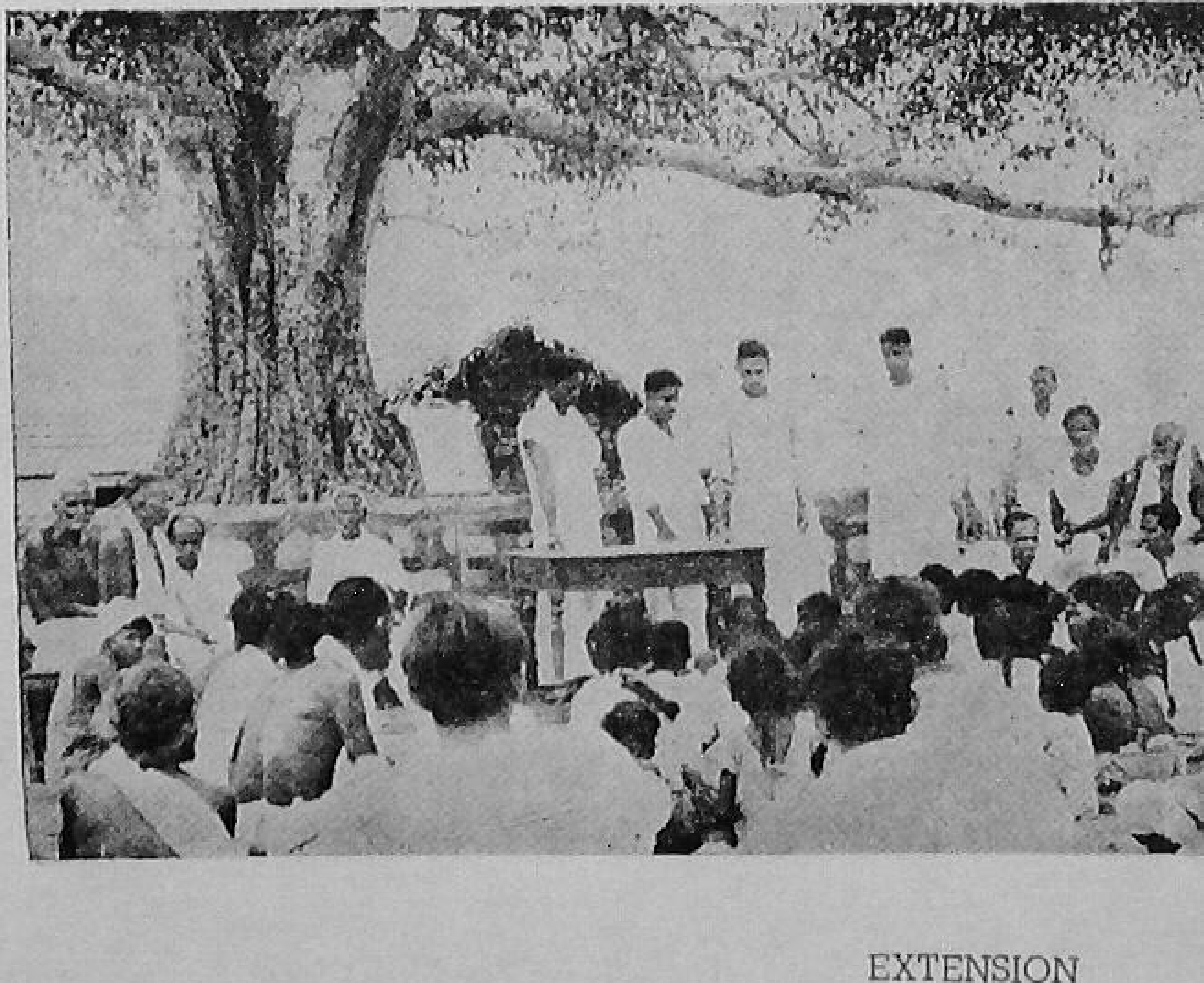
conditions and limitations and facilities and equipment are also taken into consideration while preparing the plan. If the progress is halting, the causes are carefully analysed and defects remedied. The instructors visit the villages as often as possible and offer suggestions. Special problems are brought to the class room for discussion and solution.

On the annual day, we invite the villagers to the Centre. Activities like baby show, cattle show, intra-village games, sports, exhibitions of local arts and crafts, demonstration of improved agricultural tenchniques are arranged for their benefit.

The trainees are always on the watch to find out local talent. They participate in the life of the rural community by taking active part in celebrations, functions and meetings. They spot out talented persons and give them encouragement by providing opportunities.

Recreational and cultural activities like *bhajans*, folk songs, dances. are organized. We have a community hall with a stage. This helps us in carrying on these activities all the year round. We are building an open air theatre so that a larger audience can be accomodated in fair weather.

Besides giving training to *Gram Sevaks*, we are also training *Gram Sevikas*, and Group Level Workers. The first batch of twenty six *Gram Sevika* trainees have completed their course from the Home Science Wing. So far this Institution has trained 100 extension officers for agriculture and animal husbandry, and 15 junior engineers and supervisors.



Trainees discussing problems with village leaders

CRAFTS IN THE PREPRIMARY SCHOOLS

—TARABAI MODAK

Learning skilful muscular movements of different types is a special occupation for the child between two and six years of age. He has to learn the use of his limbs and other parts of his body. The use of his hand is the most important movement that he has to master. If the child is introduced to different handicrafts at this stage, in the village preprimary school, it will help him to acquire skilful manipulation of fingers, besides providing him a useful occupation.

The skilled use of fingers, if begun early, is easier to acquire. From the age of seven and upwards, if fingers have not become used to delicate action earlier, it is very difficult to use them skilfully.

Greater skill of the fingers is required in crafts and handwork than in other activities like decoration, collection etc. Of course, we cannot expect great results from little children. They are just to be introduced to the work and allowed to master the preliminary movements.

Only those crafts, which children can easily undertake, and raw materials which are cheap and available in the villages, should be introduced in a preprimary village school. If possible these crafts should correspond to the basic crafts taught in Basic Schools.

Crafts like spinning and weaving, paper work, mat making, clay modelling, raffia work etc. can be introduced in such schools.

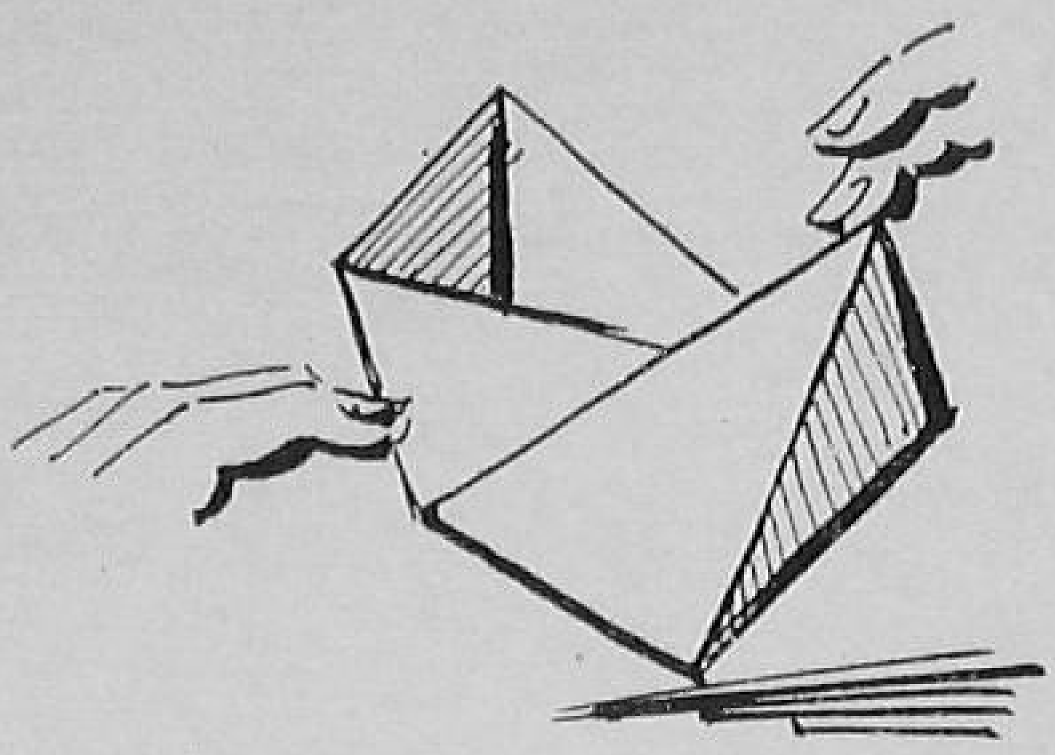
In craft work, it is necessary to leave the child free to work out his own ideas in his own way after teaching him the technique.

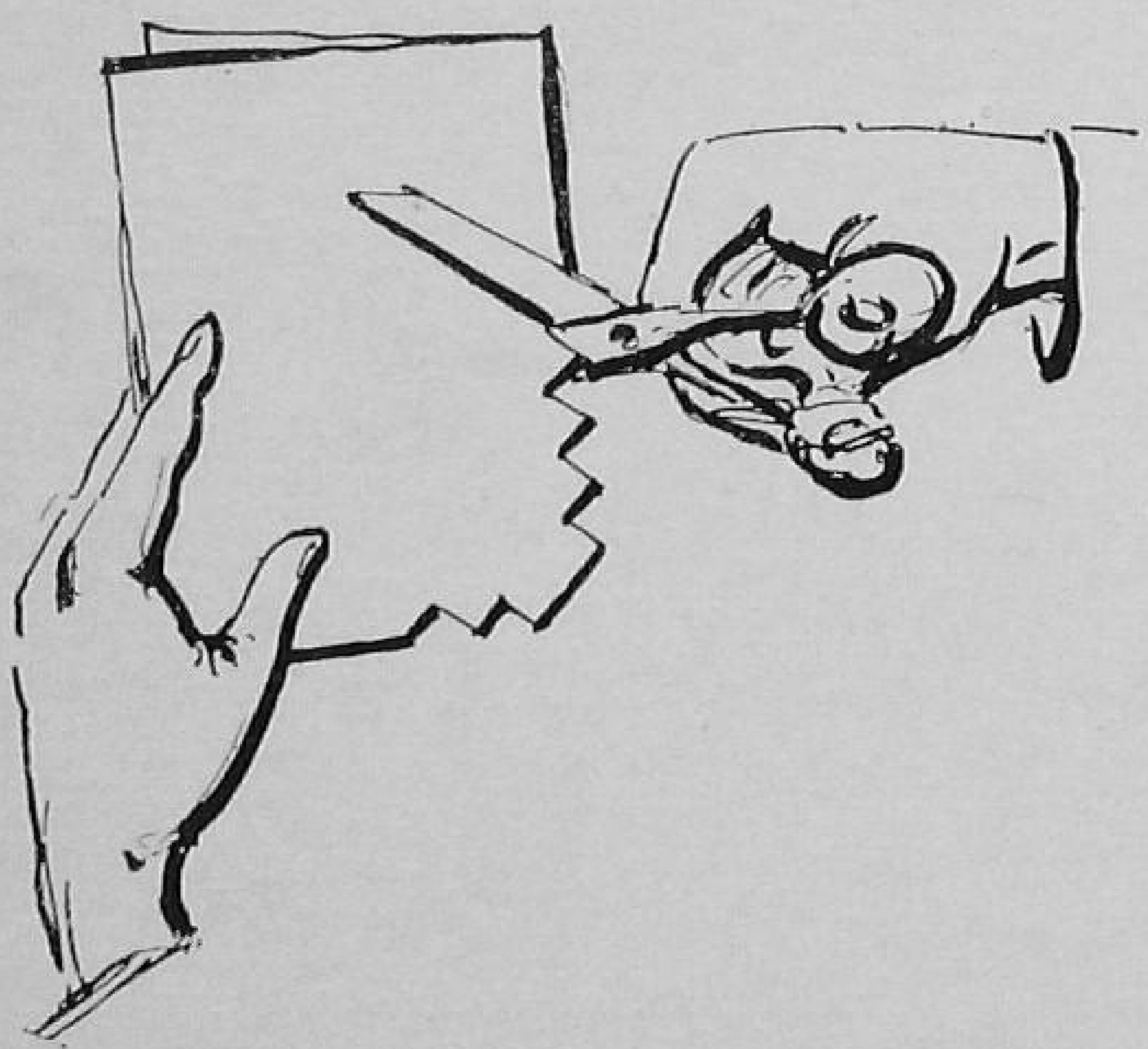
Very often we see children making certain forms again and again with no change or progress. Sometimes the repetition is necessary, but often the child is at a stagnant stage so far as that work is concerned. If stagnancy is reached, then the teacher must give the child a lift by introducing some new thing and lead him to a higher stage. For instance, in clay modelling, initially the children prepare, balls, *laddu*, *jalebies* etc. which are quite all right for the beginners. But if we see children preparing the same simple forms for days together without any progress, their attention must be drawn to other simple models, or new ideas must be suggested or some new technique must be introduced.

PAPER WORK

This is akin to cardboard modelling which is a basic craft. If we can get waste paper there are several activities that children can undertake with great interest and which are beneficial so far as skill of the fingers is concerned. Paper-cutting, paper-folding, paper-tearing, paper-sticking and paper pulp moulding are some of them. With thin coloured paper, lots of decorative things like buntings, garlands, flowers etc. can easily be made by children. They give a happy sunny look to the whole atmosphere.

Paper cutting: In this the use of scissors to cut paper is the chief thing to be learnt by the child. Small and blunt scissors can be given to children of four years of age. In the beginning they should be allowed to cut paper to pieces as they like. The idea is to let the child learn the use of scissors for cutting a piece of paper into two or more pieces. Once the child has acquired control over the movements, he should be taken ahead step by step as follows: (1) Cutting on a straight line (2) Cutting along squares or triangles and later on circles and curves and (3) Cutting pictures along their outlines. By the time he has gone through these steps, he will have acquired quite a good control on the use of scissors.

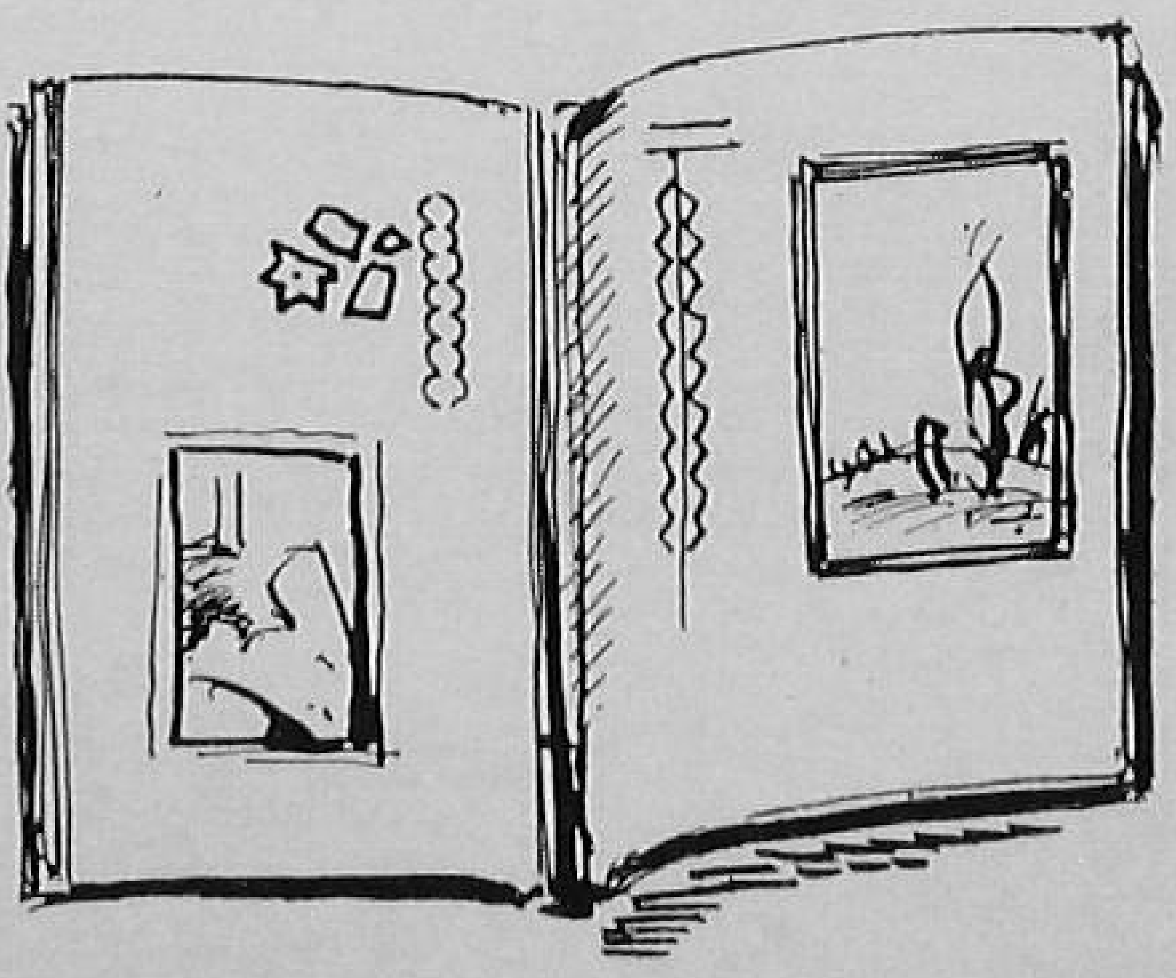


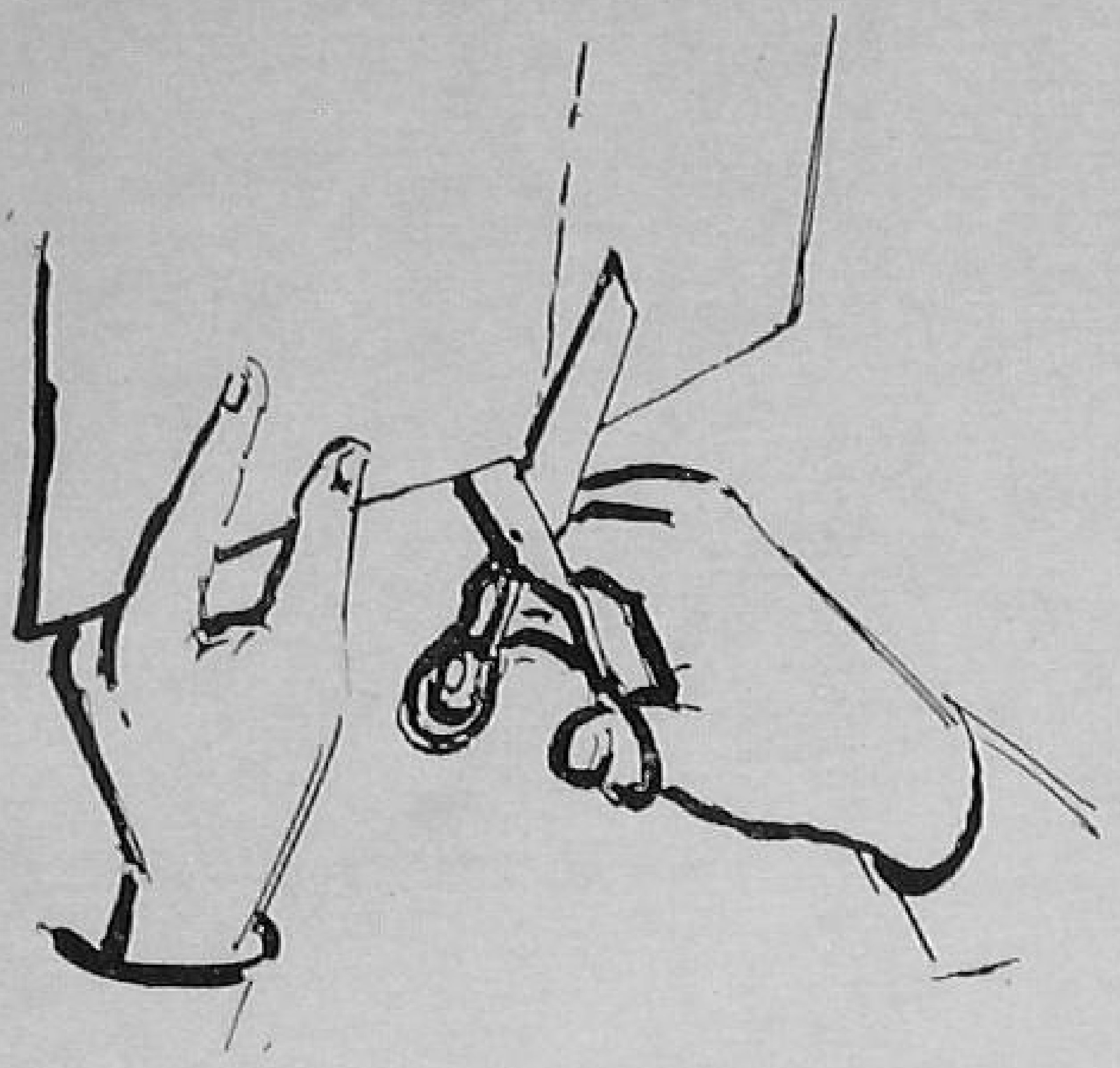


Then the children can be left free to cut papers as they like. They usually do a lot of decorative cutting with network designs.

Paper folding: For this, scissors are to be used only to cut a regular square or the shape required. Then by folding it in different ways, they can make boats of several varieties and several other things, such as flower-vases, photo-frames and other decorative designs. Folding requires geometrical accuracy; so it is a little more advanced stage than cutting.

Paper sticking: The pictures that are cut out from newspapers and magazines can be classified and stuck in a scrap book, and a picture album can be made. When designs are cut from papers many odd shaped pieces are left. These in turn can be stuck on another paper in some design. Children show much originality and artistic sense in this work. Torn pieces can be stuck on bowls, and paper vases can be made. Paper sticking is a good occupation for it helps preserve pictures and make use of waste pieces.





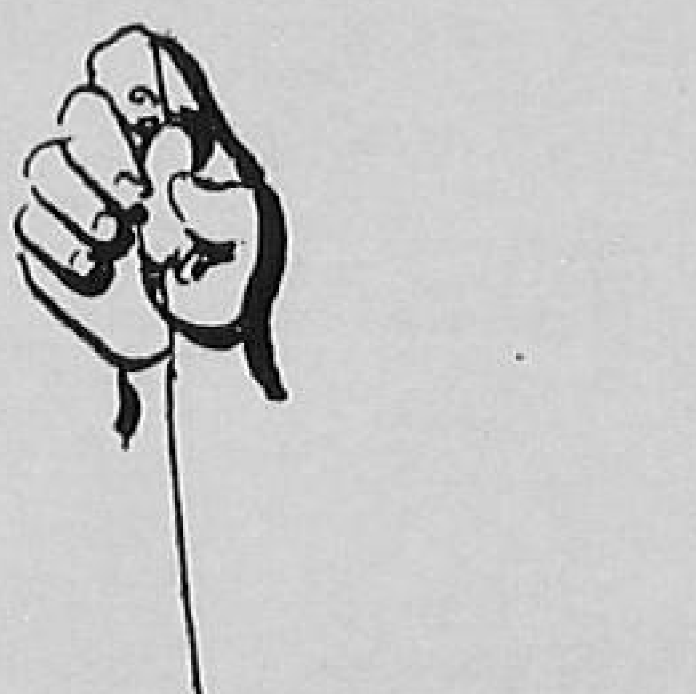
Children between five and six years of age are able to spin a little with small *charkhas* or *taklis*. The yarn produced by them often is not strong. But it can be put to some use. In many Basic Schools, children's yarn is thrown away as useless. We must be very careful about not letting this happen, so that children do feel that they are doing some useful work. If the yarn is very bad, rough carpets or napkins can be made out of that. Older children can do some work of this type. The teacher must be careful and industrious to see that it is put to some good use. Of course, in a preprimary school, spinning and weaving should not have the same influence as in a primary school. Here what is important is that only background should be prepared so that when children go to a primary school their minds are ready and eager to learn the craft.

Paper tearing: Older children can acquire the art of tearing a piece of paper with fingers and give the pieces good shapes without the use of scissors. This requires more control on the finger movements.

Paper-pulp: All the waste pieces of paper that are of no use, can be soaked in water for three days or so. Then they can be pounded into pulp and mixed with *urad* or *methi* and tamarind seed flour and a little clay. Bowls, baskets, cups etc. or relief maps can be made out of this pulp.

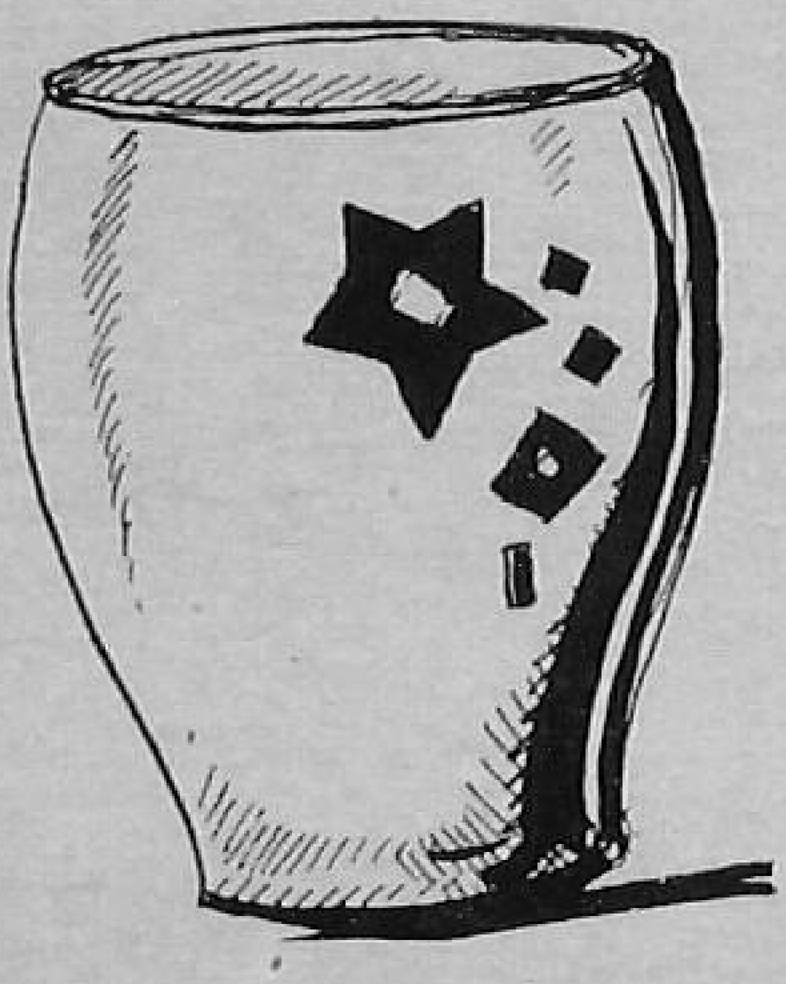
SPINNING AND WEAVING

Spinning is rather a difficult craft for children to master. But they can begin the work with cleaning cotton, taking out the seeds with an iron rod and a wooden board. Then they can do the carding and make silvers. Children between four and five are seen to master these several actions in a short time. In the areas where cotton is cultivated, children can even begin by growing cotton in small gardens. They can be taken to pick cotton in fields when it is ripe. Working in cotton fields and spinning and weaving activities create a desire in children to know more about it and also to learn the craft later on.



CLAY MODELLING

This is the cheapest and the easiest of the handicrafts that can be introduced in a pre-primary school. It can be kept as a free activity with no direction in the beginning. Later on there is a scope for much development and artistic creation in which certain guidance is necessary. Older children can prepare pots of different shapes with artistic designs out of clay. Birds, animals, human figures, fruits, flowers, in fact, anything can be a subject. This craft has an advantage over the art of drawing, in that the children prepare three dimensional models, which are more realistic. So, this craft is more suited to the lower age group.

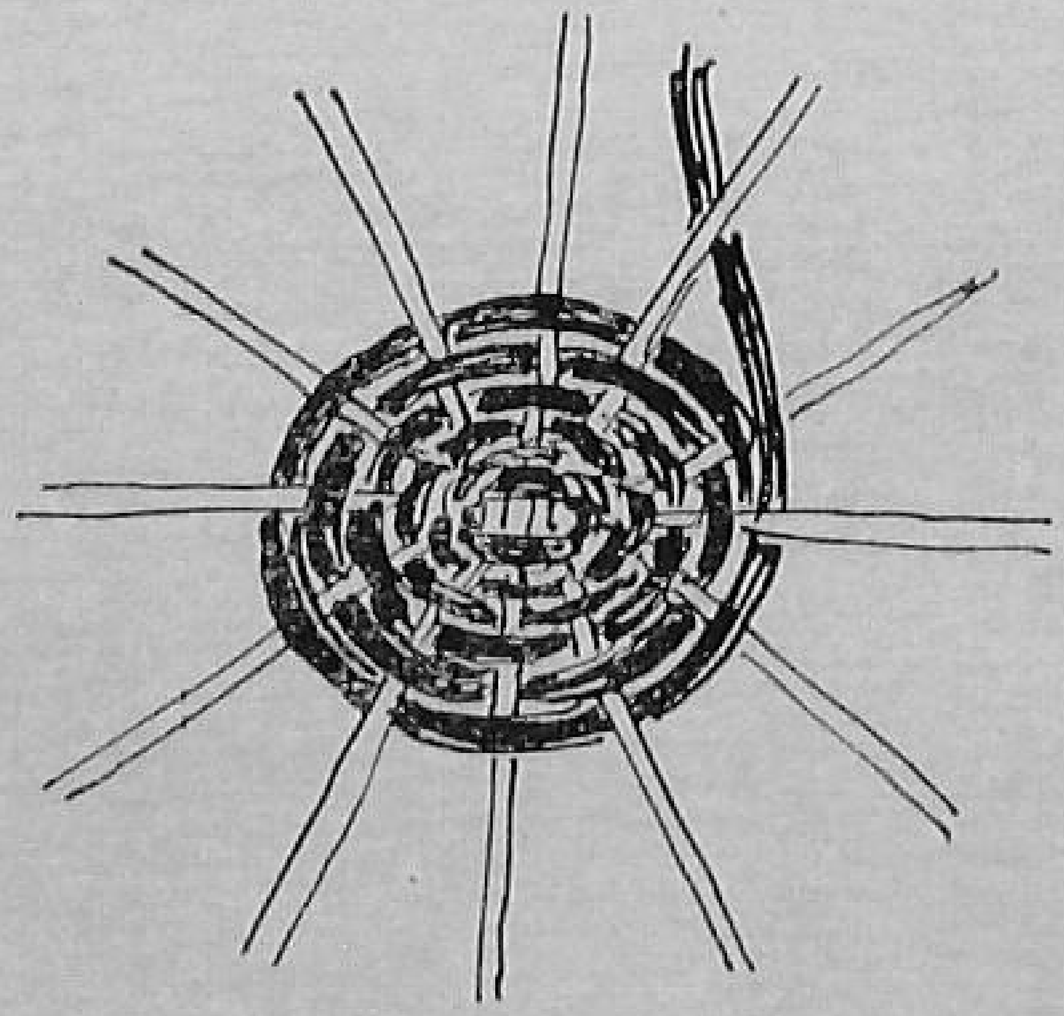


If plasticine is used we can get nicely finished products. The teacher must find out how to make plasticine with the material she gets in the rural areas. If that is not possible, ordinary clay that is available should be used.

MAT MAKING AND RAFFIA WORK

In kindergartens mat making out of paper slips is very common. But these mats are only decorative. In the rural areas, mats can be made out of *Khajura* leaves or some kinds of grass. These mats can be used by children as seats. Several other things like fans, baskets and trays can also be made.

Vegetable threads like those of *sisal* and *banana* stems can be used for raffia work. In some parts, some grass like raffia is also available. This kind of work is easy, once children know how to use a needle: many useful things like bags, purses, plates etc. can be made out of them.



A SURVEY OF THE DIETS OF Gram Sevika Trainees

R. P. Devadas ; S. Sudarsanam ;
A. Padmasini ; and S. Peravli

The *Gram Sevika* trainees in the 27 Home Science Wings of the different States learn all aspects of home living—food, clothing, shelter, health, education, management of time and income, and human relationships, by practising them in their homes and lives, in the training centre. They study the principles of food and nutrition through planning and preparing their own meals. To facilitate this learning, the *Gram Sevika* trainees are divided into three families and accomodated in small houses, so that participation by every trainee in all activities of house-keeping is possible. The three families maintain a record of expenditure on various items including that on food. At the end of every month they analyse the expenditure on food in terms of the nutritive values derived, and improve the budgets for the next month in the light of the experience gained.

Given below is a sample survey of the expenditure on food during the month of January 1957, from one of the Home Science Wings - Bhavanisagar, Madras State. The trainees of this Home Science Wing were divided into three families—the House of Culture, with 9 members; the House of Love, with 10 members; and the House of Joy, with 7 members. Each family was under the guidance of one of the three instructors of the Home Science Wing. The 'Food Committee' from each family kept careful records of the amounts of foods used daily. At the end of the month the cost and nutritive values of the foods consumed were calculated. The menus followed in the three Houses are given in table I.

TABLE I

THE MENUS FOLLOWED IN THE THREE HOUSES.

	BREAKFAST :	LUNCH :	TEA :	DINNER :
House of Culture	Pongal (Rice Ki-Chidi) Milk.	Rice, Brinjal, Curry, Rasam, (soup), Ridgegourd, Poriyal (vegetables), Gingelly Seed (til) Chutney, Butter Milk, Pickles	Milk, Bajji	Rice, Curry, Rasam, Pickle, Butter Milk
House of Love	Milk, Dhal Ki-Chidi	Rice, Cabbage, Curry, Brinjal, Sambar, Snakegourd, Curry, Curds	Milk, Fruits	Rice, Sambar, Rasam, Cabbage, Curry, Curds
House of Joy	Milk, Ravau-ppama (Suji)	Rice, Pumpkin Curry, Potato, Drumstic leaves, Yam porial, Curds	Milk, Fruits	Rice, Rasam, Curds, Pickles

Table II gives the comparative statement of expenditure on food in the three families. The measurements used for the foods in Bhavanisagar were Madras measures, viss, palam. Their equivalents are given in Table III.

TABLE II

COMPARATIVE STATEMENT OF EXPENDITURE IN THE THREE FAMILIES

Name of the Food Stuff	HOUSE OF CULTURE: Total Qntty. used	Cost (9 members)	HOUSE OF LOVE Total Qntty. used	Cost (10 members)	HOUSE OF JOY Total Qntty. used	Cost (7 members)
		Rs.As.P.		Rs.As.P.		Rs.As.P.
1. Chakki rice	77½ M	27-14-8	79¾ M	31- 0-0	59½ M	22- 1-6
2. Boiled rice	10 M	4-11-0	10 M	4-11-0	8 M	3-12-0
3. Thuwara dhal	10½ M	5- 4-0	11 M	5- 8-0	7 M	3- 8-0
4. Black gram	4¼ M	2- 4-0	3 M	1- 9-6	3½ M	1- 9-0
5. Bengal gram (broken)	3 M	1- 5-0	2½ M	1- 1-6	4 M	1-12-0
6. Green gram (broken)	1 M	0-10-0	½ M	0- 5-0	1 M	0-10 0
7. Cashew nuts		0- 3-0		0- 3-0		0- 2-0
8. Green gram (whole)	½ M	0- 3-9	1 M	0- 7-6	½ M	0- 3-9
9. Bengal gram (whole)	½ M	0- 4-6		.. ..		.. ..
10. Parched Bengal gram	4 M	1- 4-0	4 M	1- 4-0	4 M	1- 4-0

TABLE II -Contd.

11. Gurjilli oil		.. ..		.. ..	2 M	4- 8 0
12. Groundnut oil	9 M	12- 6-0	$8\frac{3}{4}$ M	12- 0-6	7 M	9-10-0
13. Brown sugar	6 V	5- 5-0	5 V	4- 6-0	$4\frac{3}{4}$ V	4- 1-6
14. Jaggary		... ...	$\frac{1}{4}$ V	0- 4-0		.. ..
15. Tamarind	$1\frac{1}{2}$ V	1- 4-0	2 V	1-12-0	2 V	1-12-0
16. Salt	8 M	0- 7-0	8 M	0- 7-0	6 M	0- 5-0
17. Red chillies	5 M	2- 3-0	5 M	2- 3 0	3 M	1- 8-0
18. Mustard	$\frac{1}{2}$ M	0- 4 0	$\frac{1}{2}$ M	0- 4-0	$\frac{3}{4}$ M	0- 6-0
19. Pepper	$\frac{1}{8}$ M	0- 6-0	$\frac{1}{16}$ M	0- 3-0	$\frac{1}{8}$ M	0- 6-0
20. Cumen seeds	$\frac{3}{8}$ M	0- 8-0	$\frac{1}{8}$ M	0- 3-0	$\frac{1}{4}$ M	0- 6-0
21. Conanda	3 M	1- 0-6	3 M	1- 0-6	1 M	0- 5-3
22. Methi	$\frac{1}{4}$ M	0- 3-0	$\frac{1}{4}$ M	0- 3-0	$\frac{1}{4}$ M	0- 3-0
23. Asofoetida	1 P	0- 4-6	$1\frac{1}{2}$ P	0- 6-9	2 Pals	0- 9-0
24. Turmeric	$\frac{1}{4}$ Lb.	0- 3-0	$\frac{1}{4}$ Lb.	0- 3-0	$\frac{1}{4}$ Lb.	0- 3-0
25. Plums		0- 2-0		0- 3-0		0- 2-0
26. Garlic	$\frac{1}{8}$ Lb.	0- 2-0	$\frac{1}{8}$ Lb.	0- 2-0	$\frac{1}{2}$ lb.	0- 8-0
27. Appalams	1 pkt.	0- 8 0	1 pkt	0- 8-0	1 pkt.	0- 8-0
28. Bengal gram powder	1 V	0-14-0	$\frac{1}{2}$ V	0- 7-0	$\frac{1}{2}$ V	0- 7-0
29. American flour (Broken)	1 V	1- 1-0	1 V	1- 1 0	1 V	1- 1-0
30. Wheat flour	$10\frac{1}{2}$ M	5- 4-0	3 M	1- 8-0	3 M	1- 8-0
31. Cuscus		.. ..		0- 2-0		0- 2-0
32. Cinnamon		.. ..		.. ..		0- 4-0
33. Dry ginger		.. ..		0- 4-0		.. ..
34. Cheekai powder	$\frac{1}{4}$ V	0- 6-0	$\frac{1}{8}$ V	0- 3-0	$\frac{1}{4}$ V	0- 6-0
35. Match box	4	0- 3-0	4	0- 3-0	4	0- 3-0
36. Chollam	1 M	0- 4-0	$\frac{1}{2}$ M	0- 2-0	2 M	0- 8-0
37. Ragi	1 M	0- 4-0	1 M	0- 4-0	1 M	0- 4-0
38. Millet	2 M	0- 8-0		.. ..	2 M	0- 8-0
39. Milk	$99\frac{1}{2}$ M	41-10-6	$109\frac{1}{2}$ M	47-14-6	112 M	48-11-6
40. Ghee	$\frac{1}{2}$ M	1- 0 0	$\frac{1}{2}$ M	1- 0-0	$\frac{3}{4}$ M	1- 8-0
41. Vegetables		34-11-9		31-10-3		31- 3-6
42. Firewood	5 bundles	6- 7-3	6 bundles	6-12-9	5 bundles	6- 3-0
43. Whole wheat		.. ..		.. ..	2 M	1- 0-0
44. Misc. expenses		8-10-9		10-14-0		5- 5-0
TOTAL EXPENDITURE :		Rs. 170- 6-2		Rs. 172-11-9		Rs. 159- 5-0

TABLE III

EQUIVALENTS OF LOCAL MEASURES IN OUNCES

M	:	Madras Measure
V	:	One Viss
P	:	One Palam
1 Viss	=	40 Palam
1 Palam	=	3 Tolas
	=	1·2 Ounces
1 Ounce	=	28·4 Grams

Foodstuff	Amount in Local Measure	Ounces
Boiled rice	$\frac{1}{4}$ Measure	$8\frac{1}{2}$
Chakki rice	$\frac{1}{4}$,,	7
Dhall	$\frac{1}{4}$,,	7
Bengal gram (whole)	$\frac{1}{4}$,,	$7\frac{1}{4}$
Cholam or corn	$\frac{1}{4}$,,	$7\frac{1}{4}$
Green gram	$\frac{1}{4}$,,	$6\frac{3}{4}$
Bengal gram	$\frac{1}{4}$,,	8
Atta	$\frac{1}{4}$,,	6
B. gram flour	$\frac{1}{4}$,,	7
Ragi flour	$\frac{1}{4}$,,	$6\frac{3}{4}$
Ragi	$\frac{1}{4}$,,	$7\frac{1}{2}$
Ground nut	$\frac{1}{4}$,,	$8\frac{1}{2}$
Ground nut oil	$\frac{1}{4}$,,	$7\frac{1}{2}$
Milk	$\frac{1}{4}$,,	10
Black gram	$\frac{1}{4}$,,	7

The average daily intake of the various foods per trainee in the three families is given in Table IV.

TABLE IV

DAILY INTAKE PER TRAINEE OF THE VARIOUS FOODS

Name of the food stuff	Average intake in ounces per day		
	House of Culture	House of Love	House of Joy
Cereals			
Rice, wheat	11·0	11·2	10 (Rice) 3 (Broken wheat)
Pulses			
Red dhal	1·6		2·0
Green gram	1·6		
Bengal gram	·4 } 5·0	1·4	
Black gram	1·4		·5
Green leafy Vegetables	—	1·5	1·9
Other Vegetables			
Ridgegourd	2·5 } 4·5		
Brinjal	2·0	2·0 } 2·2	
Snake gourd curry		0·2	
Pumpkin			1·8
Roots & Tubers			
Potatoes			1.5
Yam			2·0
Onions	1·3	1·0	1·0
Nuts & Oil Seeds			
Gingelly seeds (Til) & cocoanuts	·4 } 1·4	1·0 } 2·5	1·5
Groundnut oil	1·0	1·5	1·0
Milk & Milk Products	15·0	16·0	20·0
Sugar	2·0	1·0	...
Fruits			
Bananas	2·0	2·5	1·0

The total cost on food per month per trainee as compared with the nutritive values of foods consumed is given in Table V.

TABLE V

AVERAGE MONTHLY EXPENDITURE ON FOOD PER TRAINEE AND THE NUTRITIVE VALUES OF FOODS

Name of Family	No. of members	Calories	Protein (Gms)	Calcium (Gms)	Iron (Mgs)	Vitamin A (I.U.)	Riboflavin (Mgs)	Vitamin C(Mgs)	Amount spent per head per month
House of Culture	9	2,252	73·3	1·0	31	1,471	13·9	36	Rs. 18-15-0
House of Love	10	1,962	67·3	·4	27·9	7,980	15·0	128	Rs. 17- 4-10
House of Joy	7	2,535	75·9	1·5	31·0	2,942	15·5	102	Rs. 22-12-1
Recommended daily requirement		2,200	67·0	1·0	25·0	3,000	3·00	50	

The expenditure on food in the three Houses included the cost of firewood also.

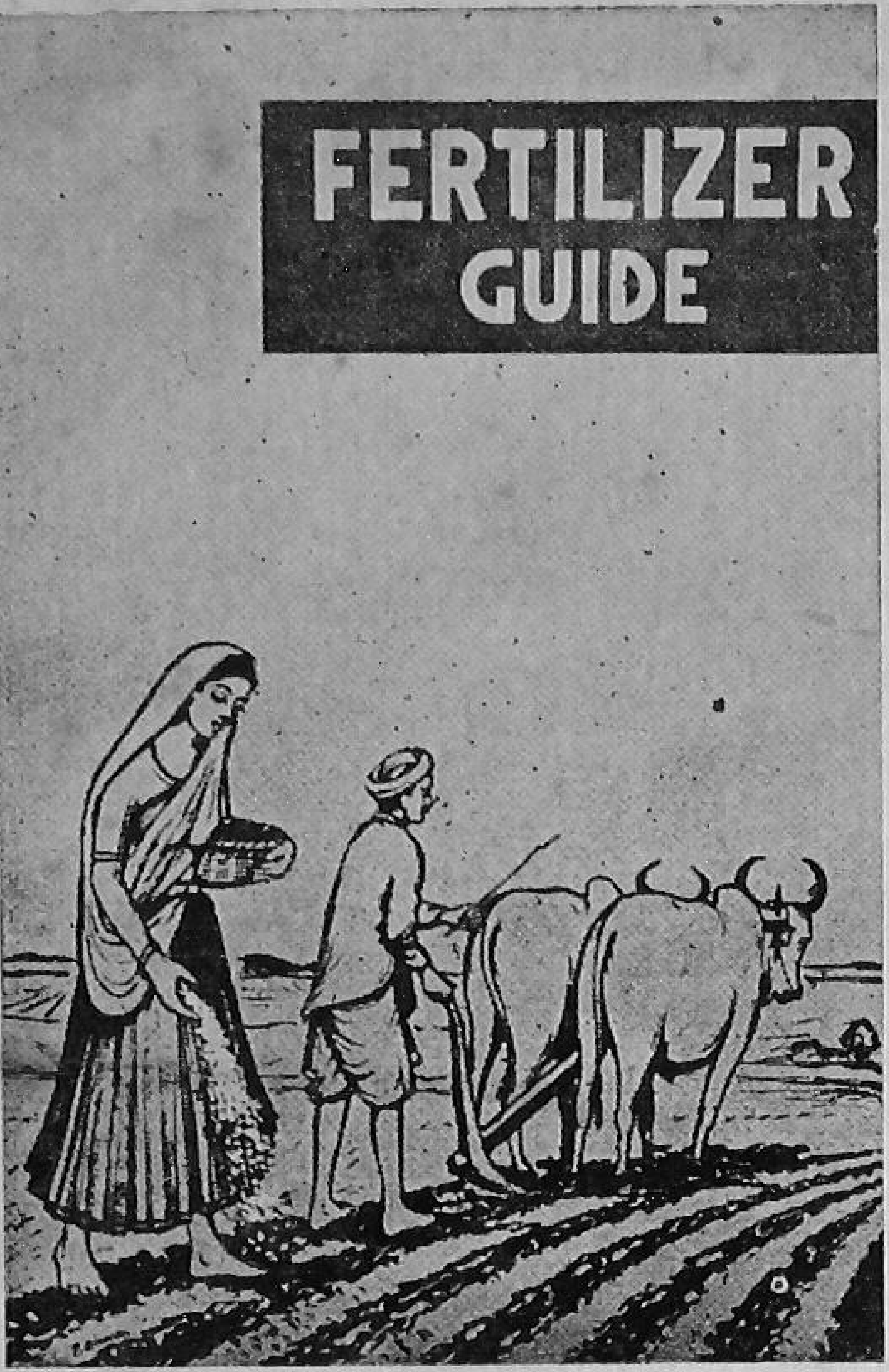
The House of Joy spent the most on food. This is probably due to the higher intake of milk in that House and also the number of members being smallest. Their intakes of cereals, vegetables and oils were also higher than in the other Houses.

The members of the House of Culture consumed the least amount of vitamins A and C, having not included any leafy vegetable at all in the daily diet during that month. If they had only included at least 2 ounces of leafy vegetable in the daily diet, the deficiency of the vitamins could have been made up. In fact the other two Houses could also have increased the intake of green leafy vegetables to advantage.

The House of Love had spent the least amount of money on food. The members of this House consumed the least number of calories. This was due to the fact that their consumption of pulses was very low. They should have included at least 3 ounces of pulses every day and 12 ounces of cereals.

All the three Houses were able to secure the optimum amounts of calcium, iron and vitamin B - 2. This is commendable, considering the low cost of the diets consumed.

This study reveals that adequate diets are possible within the economic means of the *Gram Sevikas*, for low costs in rural homes, if planned properly and cooked to conserve nutritive values. The importance of the inclusion of any leafy green vegetables, atleast 2 to 3 ounces in the daily diet, has been brought out by the fact that the vitamins A and C contents of the diets in the Houses of Love and Joy were adequate.



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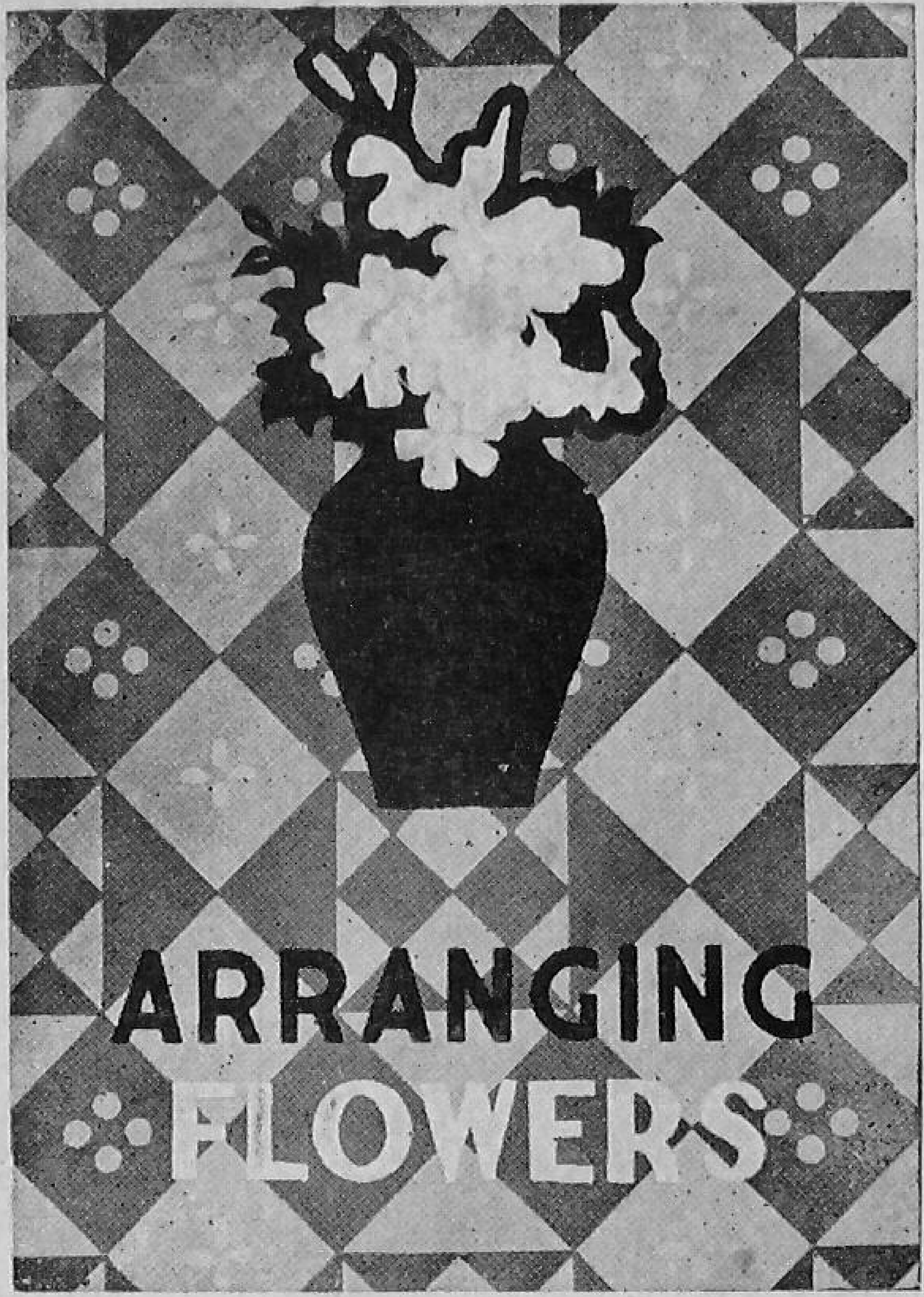

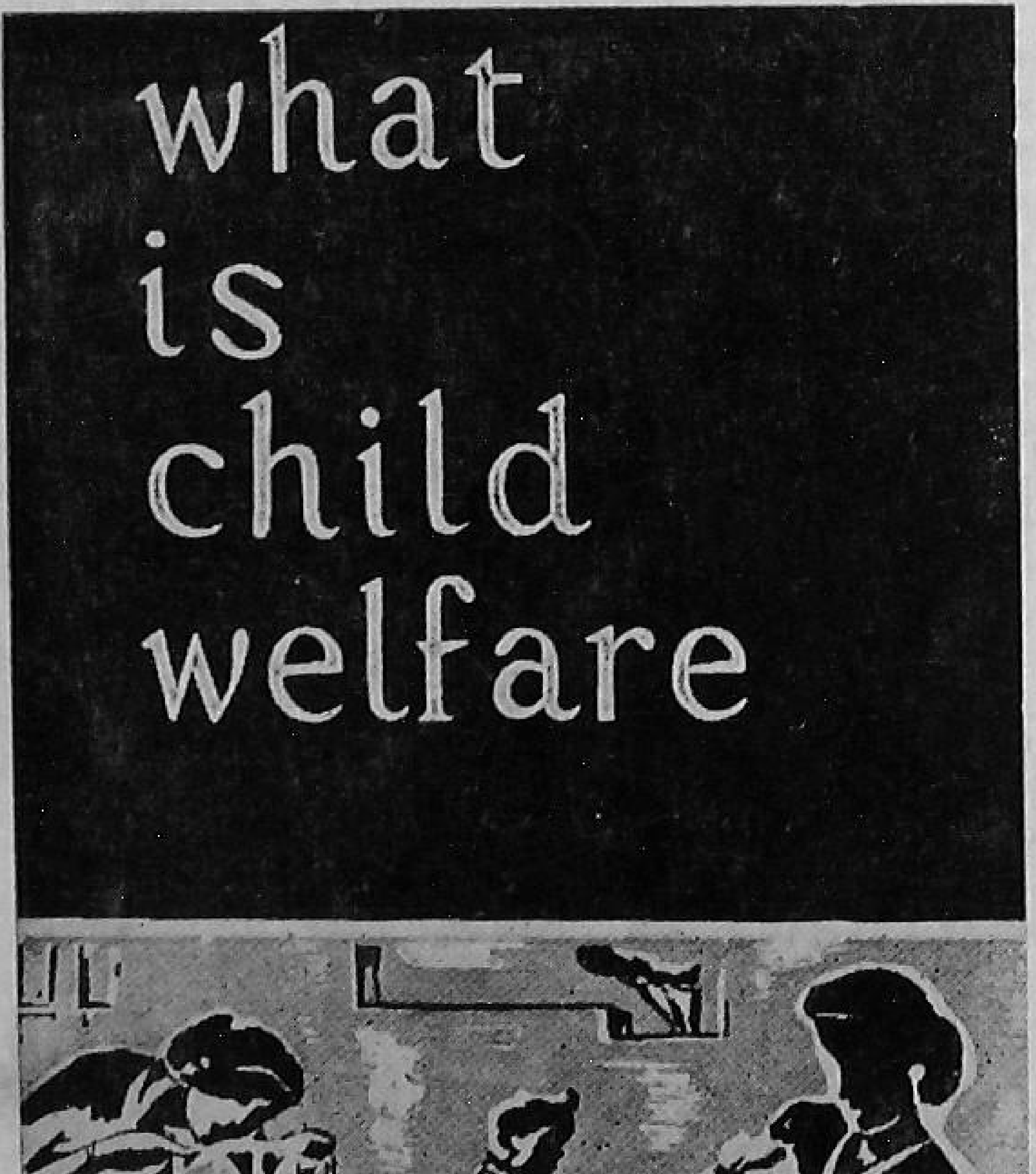

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